110 Riverside Ave

Project Impact Narrative – DRAFT **12/11/2012**
110 Riverside Ave, Burlington, VT
Sisters and Brothers Investment Group

Sisters and Brothers Investment Group is proposing the construction of 57 one and two bedroom apartment units on a 1.22-acre parcel located at 110 Riverside Avenue in Burlington. The project will have a 20% inclusionary housing component, or 11 units. Parking spaces for the residents are predominantly located beneath the building, with only a small surface lot provided to the east. The following narrative addresses applicable review criteria pursuant to Section 3.5.6(b) of the Burlington Comprehensive Development Ordinance.

- The capacity of existing or planned community facilities.

- The character of the area affected as defined by the purposes of the zoning district within which the project is located, and specifically stated policies and standards of the municipal development plan.

The project is located in a Neighborhood Mixed Use District – the Neighborhood Activity Center – Riverside (NAC-R). This district allows commercial uses, but is also intended to promote attractive development, an open and pleasant street appearance, and compatibility with adjacent residential areas. Development is intended to be aesthetically pleasing for motorists, transit users, pedestrians, which has been provided for through extensive landscaping and a pleasant building façade. Parking is placed beneath the building and to the side, and not in front of the building, per district requirements. Multi-family dwellings are an allowed residential use in the NAC-R district.

- Traffic on roads and highways in the vicinity evaluated in terms of increased demand for parking, travel during peak commuter hours, safety, contributing to congestion, as opposed to complementing the flow of traffic and/or parking needs.
- Not cause unreasonable congestion or unsafe conditions on highways, streets, waterways, railways, bikeways, pedestrian pathways or other means of transportation, existing or proposed

The project is expected to generate 32 AM peak hour trips and 49 PM peak hour trips – see attached Traffic Brief.

Parking needs are expected to be fully accommodated on the site, with the majority of the spaces being located beneath the building. At one space required per unit in this

district, 57 spaces are required. There are 49 reserved spaces provided beneath the building, and the remaining 8 reserved spaces are in the surface lot. An additional 3 guest spaces are provided on the surface lot. The applicant has indicated that approximately 50% of the units will likely be rented to tenants that do not need a car space, but would make use of mass transit or pedestrian facilities.

- The utilization of renewable energy resources.

- Not result in undue water, air, or noise pollution;

The proposed residential project will produce a limited amount of noise during the construction phase, during which hours of construction will be limited to 7am-7pm Monday through Friday and 7am-12pm on Saturday.

Air pollution resulting from this project will be at a minimum given the residential nature of the project. The heating system will utilize natural gas. Vehicle idling time should be relatively low on account of the under-building parking spaces provided to tenants.

Rooftop runoff and the majority of other impervious surfaces on the site are collected by a catch basin system, which is routed through an ADS Water Quality Unit for sediment pretreatment, leading to a subsurface stormwater detention structure consisting of Brentwood Stormtanks. Additionally, a rain garden is provided in front of the building to capture and treat runoff from front sidewalks and a small portion of the driveway. No stormwater treatment facilities currently exist for the approximately 21,000 sq. ft. of existing impervious surfaces, so the proposed treatment facilities will provide a much improved water quality scenario.

- Have sufficient water available for its needs;

A letter has been provided by the Department of Public Works stating that the City of Burlington's water facilities have sufficient capacity to handle the demand associated with the proposed apartment.

- Not unreasonable burden the city's present or future water supply or distribution system;

The results of hydrant flow tests and a hydraulic analysis provided by the DPW indicate that the water supply and distribution system will not be unreasonable burdened by the peak demand from the proposed building.

- Not cause unreasonable soil erosion or reduction in the capacity of the land to hold water so that a dangerous or unhealthy condition may result

The net increase in impervious surfaces is approximately 6,000 sq. ft., with a proposed stormwater retention facility. During large storm events, the unit will fill with runoff, to be retained and slowly released, resulting in a larger capacity for holding water than current conditions allow. Soil erosion and slope stabilization are prevented or minimized through the use of silt fence, straw mulch, erosion control blankets, as shown on the Demolition and Erosion Control Plan. Permanent erosion control measures include seeding and retaining walls.

- Not cause an unreasonable burden on the city's ability to provide educational services;

The proposed apartment units are likely to be rented predominantly by singles and young professionals. Small families may also rent as there will be total of 30 two-bedroom apartment units. Schools serving this area of Riverside Ave include HO Wheeler Elementary, Edmunds Middle School, and Burlington High School.

- Not place unreasonable burden on the city's ability to provide municipal services;

The proposed building will have access on three sides and a new hydrant is proposed near the project driveway for fire protection. Additionally, the building will be fitted with sprinklers and a stand pipe.

- Not have an undue adverse effect on rare, irreplaceable or significant natural areas, historic or archaeological sites, nor on the scenic or natural beauty of the area or any part of the city;

The majority areas on the site proposed for construction have been previously disturbed or are currently developed. The Agency of Natural Resources Natural Resource Atlas does not indicate that there are rare, irreplaceable, or significant natural areas on the project site.

- Not have an undue adverse effect on the city's present or future growth patterns nor on the city's fiscal ability to accommodate such growth, nor on the city's investment in public services and facilities;

The project is an infill project that would not impact the city's present or future growth pattern. The Municipal Development Plan designates the south side of Riverside Ave as an area planned for growth.

- Be in substantial conformance with the city's municipal development plan and all incorporated plans;

Per the Municipal Development Plan, the City of Burlington welcomes continued growth, primarily in the form of infill and redevelopment. The plan encourages urban densities, and indicates that the City is seeking to concentrate further higher-density development in Neighborhood Activity Centers. Pedestrian connectivity is established to the west, via a sidewalk, recently reconstructed during the Riverside Ave roadway reconstruction project.

- Not have an undue adverse impact on the present or projected housing needs of the city in terms of amount, type, affordability, and location;

The proposed building will have a positive impact on the housing needs of the city, in addition to adding 57 rental apartment units, a minimum of 11 of those units will be deemed inclusionary. The apartment building is sited on a CCTA bus route, and is within walking distance of several commercial businesses on Riverside Ave, as well as downtown Winooski's commercial center.

- Not have an undue adverse impact on the present or projected park and recreation needs of the city.

A gathering and play space will be provided for residents in the rear of the building. Residents also have easy access to Salmon Hole park, a Winooski Valley Park District park, located on the north side of Riverside Ave, directly across from the proposed project.

Environmental Engineer Services for contaminates

Print | Close Window

Subject: Brothers and Sisters Investment Group, Riverside Apartments, 110 Riverside Avenue, Burlington, Vermont
From: Russ Barton <RBarton@wilcoxandbarton.com>
Date: Thu, Dec 13, 2012 3:21 pm
To: "steve@steveguilddesign.com" <steve@steveguilddesign.com>, 'joseph Handy' <joehandy@handyvt.com>

Steve,

As discussed, should contamination be identified during the development project, Wilcox & Barton, Inc. will provide the following services. A qualified field scientist will observe soil excavation activities, document soil conditions, and collect soil samples. Soil samples will be screened for the presence of volatile organic compounds using headspace sampling methodology. Soil samples exhibiting the presence of organic vapors will be segregated and stockpiled. Stockpiled soils will be managed to prevent contaminant migration to other areas of the site.

Analytical samples will be collected from stockpiled soils to characterize the material for disposal. Following receipt of the characterization data, Wilcox & Barton, Inc. will evaluate the data, select an appropriate disposal method, select an appropriate disposal facility, complete the facility waste profile, prepare a Bill of Lading, and arrange to have the soil transported off the site for proper disposal or recycling.

During soil excavation activities, representative soil samples will be collected from the sidewalls and bottom of the various excavations. Samples will be submitted to a laboratory for the analysis of selected compounds as appropriate for the nature of the contamination. The analytical soil results will document post-excavation conditions on the site. Residual contamination, should it be present, will be evaluated given the location(s) on the site.

Throughout the project, soil conditions will be evaluated in regards to appropriate regulatory notification requirements.

Let me know what you think and if additional details are required.

Joe,
Please give me a call when you get a chance to ensure we are on the same page regarding this site and our services.

Regards.
RB

Russell W. Barton PRINCIPAL GEOLOGIST
Office: (603) 369-4190 x502
Fax: (603) 369-6639
Mobile: (603) 491-8026

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...providing outstanding and responsive environmental and engineering services...

110 Riverside Avenue
Stormwater Management Plan

General Information

Project Address:	110 Riverside Avenue
Owner:	Sisters and Brothers Investment Group
Engineer:	Trudell Consulting Engineers (TCE)

The Applicant, Sisters and Brothers Investment Group, proposes a multi-unit apartment building for the former site on Riverside Avenue in the City of Burlington. A subsurface stormwater treatment system is proposed to treat proposed and redeveloped impervious surfaces. The site drains to the City of Burlington stormwater conveyance system which discharges directly to the Winooski River.

Existing Conditions

Currently, the site consists of a building and parking lot. To the south of the existing facility is a steep slope leading up to Colchester Avenue. There are two distinct drainageways that lead to the southern edge of the parking area, one intercepted by an open culvert, and one by a catch basin. These structures lead to a catch basin on the northwest of the property, which discharges northward, across Riverside Avenue, to a swale that leads to the Winooski River.

Soils for the site are mapped by the NRCS as a mixture of Hartland Very Fine Sandy Loam (HSG B) and Fill Land. For the purposes of stormwater modeling, the entire site was presumed to be HSG B.

Due to the offsite drainage to the south, the groundwater table is relatively high (less than four feet). Redevelopment of this parcel must address both the surface and groundwater issues in the site design.

Proposed Conditions

The proposed project consists of a residential building, two access driveways, surface and underground parking areas, and a recreational area on the south side of the building. A stormwater system has been designed to capture and treat the runoff from the building and a portion of the surface parking lot/access driveway. Treated runoff, along with untreated on- and off-site runoff, is captured by catch basin and conveyed to the catch basin in the northwest corner of the site, which is proposed to be rebuilt.

Stormwater Management Plan

Table 1 summarizes the current and proposed impervious cover of the site.

Table 1: Impervious Change Summary

Condition	*Type*	*Impervious (s.f.)*
Existing Condition	Existing Impervious	28,401
Proposed	Total Proposed	32,931
	Net New Impervious	4,530
	Existing Impervious to Remain	0
	Redeveloped Impervious	28,401

The majority of the impervious surfaces (19,863 square feet of roof, 4,094 square feet of pavement) are intercepted by roof drain and catch basin, which is routed to an ADS Water Quality Unit for sediment pretreatment, leading to a subsurface stormwater detention structure (SSDS) consisting of Brentwood Stormtanks. These structures are of the "milk crate" variety, and have a void ratio of 97%. This high ratio maximizes the amount of storage available. In addition, a rain garden has been designed at the front of the building to capture pavement that does not drain to the SSDS as well as some of the walkways on the front portion of the building.

A portion of pavement and walkway (1,960 square feet) is routed to a rain garden located at the front of the building. This Low-Impact Development feature provides storage for runoff to infiltrate before overflowing into a yard drain that is connected to the site's drainage system.

In order to manage off-site water flowing onto the property, catch basins are proposed on the backside of the building which are connected to the main trunk of the drainage system. The proposed walkways on the backside of the building (2,787 square feet) drain to these structures; due to grading considerations, these surfaces cannot be routed into the SSDS. Other areas unable to be conveyed to the SSDS include the front portion of the site, including the driveway from Riverside Avenue to the underground parking area, the walkways on the north and west side of the buildings, and a small portion of the driveway/surface parking lot. These areas total 4,225 square feet.

Based on conversations with Megan Moir with Burlington's Department of Public Works, the site was analyzed to determine whether infiltration is feasible. Reviewing the soil boring data, it was determined that due to the high water table, infiltration practices would not conform to the 2002 Vermont Stormwater Management Manual (VSMM). Refer to Appendix A for a map showing boring locations and depth to groundwater.

Also discussed were the requirements for water quality treatment. At a minimum, Ms. Moir requested that the net new impervious cover (4,530 square feet) be captured and treated prior to discharge. Due to the compact nature of the site,

subsurface treatment systems were determined to be the most practical alternative. As such, water quality treatment could only be accomplished by a sand filter. However, due to the mild slopes of the project area, a five foot deep sand filter/detention structure was not feasible. Sediment removal will be addressed by the Water Quality Unit. It is anticipated that the SSDS will retain water long enough for more sediment to accumulate, but as the discharge orifice is located at the base of the structure, cannot be considered a water quality treatment practice. The rain garden will also serve as a water quality treatment device. With these two features, approximately 6,000 square feet of pavement and 20,000 square feet of rooftop will be treated for water quality.

Refer to Table 2 for the amounts of new and redeveloped impervious surfaces captured and treated by the proposed stormwater system.

Table 2: Stormwater Management Summary

	Amount of Impervious Managed	
Standard	*Net New Impervious*	*Redeveloped Impervious*
Water Quality/Grit Removal	4,530	21,388
Runoff Reduction	1,960	0
Q1 Peak Control/Reduction	4,530	21,388
Q10 Peak Control/Reduction	4,530	21,388

Water Quality calculations to support the selection of the Water Quality Unit have been provided in Appendix B of this Management Plan. HydroCAD modeling results for the existing and proposed conditions have been provided in Appendix C. Refer to Table 3 for a comparison of existing peak runoff rates to proposed peak runoff rates for the design storms.

Table 3: Stormwater Quantity Criteria Summary

Criteria	*Existing Conditions*	*Proposed Conditions*
1-Year Storm	0.63	0.51
10-Year Storm	2.47	2.35

Required Plans

Drawings in this submission set include the following:

- Sheet C1-03: Existing Conditions Plan
- Sheet C2-01: Site Plan
- Sheet C4-01: Existing/Proposed Watersheds Plan
- Sheet C4-02: Stormwater System Layout
- Sheet C8-02: Stormwater Details

Stormwater Operation and Maintenance Plan

Sheet C4-02 is a simplified site plan highlighting the stormwater treatment measures for the site. Each feature has inspection and maintenance tasks, which are summarized in the table below:

Table 4: Stormwater System Inspection and Maintenance Requirements

Feature ID	*Component Type*	*Inspection Item*	*Frequency*	*Maintenance Item*
CB1	Catch Basin	Check sediment in sump	Semi-Annually	Clean if accumulation is greater than 50% of depth
CB2	Catch Basin	Check sediment in sump	Semi-Annually	Clean if accumulation is greater than 50% of depth
CB3	Catch Basin	Check sediment in sump	Semi-Annually	Clean if accumulation is greater than 50% of depth
CB4	Catch Basin	Check sediment in sump	Semi-Annually	Clean if accumulation is greater than 50% of depth
CB5	Catch Basin	Check sediment in sump	Semi-Annually	Clean if accumulation is greater than 50% of depth
DMH1	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH2	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH3	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH4	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH5	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH6	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
DMH7	Drainage Manhole	Check structure for blockages	Annually	Remove blockage
YD1	Yard Drain	Check structure for blockages and/or clogging	Annually	Remove blockage
WQU1	Oil/Grit Separator	Check sediment accumulation	Semi-Annually	Clean if accumulation is greater than 50% of depth
SSDS	Subsurface Detention System	Check sediment accumulation	Annually	Clean if accumulation at outlet is greater than 2 inches
SSDS OS	Controlled Outlet Structure	Check structure for blockages and/or clogging		
RG1	Rain Garden	Check for areas of erosion/scour	Semi-Annually	Replace soil and/or mulch as needed
		Check for dead plants	Semi-Annually	Replace as necessary with listed species only
		Check for invasive weeds	Semi-Annually	Remove as necessary, replace as noted above

Burlington Department of Public Works
Stormwater Program
645 Pine Street
Burlington, VT 05401
PH: 802-540-1748 Email: mmoir@ci.burlington.vt.us

Small Project Erosion Prevention & Sediment Control Plan

This questionnaire, at a minimum, is required to accompany all zoning or building permit applications which involve 400 sq. ft. or more of land disturbance. Please also provide a site plan indicating the locations of all erosion prevention and sediment control measures (silt fence, hay bales etc).
Properties with greater than 2500 sq. ft. of total impervious surfaces, that are adding more impervious, will also be required to comply with additional long term stormwater management requirements.

1. Project Location 110 Riverside Ave
2. Brief Project Description (i.e. house foundation, swimming pool)
   Multi-unit apartment building

3. Owner Name: Sisters + Brothers Investment Group
4. Owner Mailing Address: 75 S Winooski Ave. Burlington, VT
5. Owner Phone: 802-862-8553 6. Owner email: _____
7. Contractor Name: TBD
8. Contractor Phone: _____ 9. Contractor Email: _____
10. Estimated Project Start Date May 2013 Estimated End Date _____
11. Area of Land Disturbance 52,000 sq. ft.
12. Total proposed (existing + new) amount of impervious: 27,470 sq. ft.
13. Estimated distance in feet from disturbance to nearest:
    a. City Sidewalk or Street 0 ft b. Drainage Ditch 0 ft
    c. Catch Basin (storm drain) 0 ft d. Lake/River/Stream 300 ft
14. Site plan/sketch MUST BE ATTACHED showing the following:
    ☑ Limits of disturbance ☑ Direction of stormwater flow on site
    ☑ Location of stockpiles (if any) ☑ Location of sediment control BMP's (silt fence etc.)

EPSC QUESTIONNAIRE ***(See last page for typical solutions to these questions)***

A) Nature of all site disturbances (check all that apply):

☑ Underground utility trench(es) ☑ curb cut/driveway ☑ foundation ☑ cut/fill/regrading ☑ landscaping

☐ other _____

B) Do you anticipate the need for any dewatering of excavations during the construction? ☒ Yes ☐ No

- If yes, how will the pumped water be managed or filtered to prevent the discharge of dirty water?
  Water will be pumped from a sump to a silt bag before discharging to a catch basin - see detail sheet

*impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

C) Will excavated soil be stockpiled on the site? ☑ Yes ☐ No

- If yes, how long will the stockpile be on site? (i.e. 1 day, 1 week) TBD

  How do you propose to control erosion of the stockpile? stockpile will have a perimeter silt fence, and be seeded if inactive more than 7 consecutive days.

- If no, where is the ultimate disposal of excess soil? _____

D) How do you propose to prevent sediment from leaving the site and entering nearby city sidewalks/streets and storm drains and/or lakes, rivers and streams? (see page 4 for examples)

Stone bag inlet protection, silt fence

E) Do you plan to park construction vehicles on or disturb City owned property like the greenbelt area? ☑ Yes ☐ No

- If yes, tell us how you agree to repair all disturbances or damage to City owned property and provide a written approval from the City allowing construction vehicles to park on City owned property.

City-owned property will be disturbed during utility connection installation. Areas will be restored to pre-construction conditions.

- If no, then please monitor all construction and visitor vehicles and advise all not to park on City owned property.

F) How do you propose to either prevent or clean sediment generated from construction vehicles and activities that becomes deposited on City streets, sidewalks, or bikepaths and how frequently this will be done.

Prevent - stabilized construction entrance - removes sediment from tires prior to entering City street. Sidewalks will be cleared weekly

G) Will stockpiles or disturbed soils be present and/or exposed after Nov. 1st of any construction year? ☑ Yes ☐ No

- If yes, tell us how you plan to stabilize any stockpile and/or disturbed soils.

stockpile will be seeded/mulched daily if inactive for more than 24 hours

Do you agree to abide by the following conditions?

☑ Y ☐ N Applicant will call 540-1748 or email mmoir@ci.burlington.vt.us at least 24 hours prior to initiating earth disturbance and submit the **name and contact (cell phone and email) of the erosion control coordinator for the project**

☑ Y ☐ N Applicant will post the approval notice in a visible location

☑ Y ☐ N I acknowledge that it is the responsibility of the owner and his/her representatives to ensure that:
- sediment does not enter surface water bodies (streams, ditches, ponds, lakes, wetlands etc.)
- sediment does not enter City conveyance infrastructure (catch basins, sewers etc.) and
- All sediment must be removed from the city ROW (sidewalks and roadways) by the end of each work day.

☑ Y ☐ N Sediment control measures will be installed prior to the initiation of earth disturbance.

☑ Y ☐ N During the non-winter construction season (April 15 – November 1): After an initial **14 day** period of initial disturbance, temporary or permanent stabilization (mulching, erosion control matting or tarps for stockpiles, or other approved method) of exposed areas and stockpiles will occur at the end of each work day unless:
- Earthwork is to continue in the area within the next 24 hours **and** there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches.

☑Y ☐N During the winter construction period from November 1 to April 15, any **new disturbance** must be temporarily or permanently stabilized (mulching, erosion control matting or tarps for stockpiles, or other approved method) will occur at the end of each work day unless:

- Earthwork is to continue in the area within the next 24 hours **and** there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self-contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches)

☑Y ☐N The perimeter of the site and all BMPs will be inspected at the **end of each workday** to ensure that sediment will not leave the site. If sediment has travelled beyond the site boundary, it shall be swept up or otherwise removed and deposited on-site in an upgradient area at the **end of each work day.**

☑Y ☐N The owner and his/her representatives shall abide by the best management practices (BMPs) indicated in this plan and conditions and in the Vermont DEC Low Risk Site Handbook for Erosion Prevention and Sediment Control (2006). Contact 802-540-1748 for a hard copy or go to the web: http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

☑Y ☐N **If soils will be exposed after November 1st and winter construction has not been permitted the project will notify DPW prior to October 15th.** If the project is completed during the winter months, an additional inspection will be required to ensure that the site is buttoned up for the winter.

☑Y ☐N Within 48 hours of reaching final grading, the exposed soil will be seeded and mulched or covered with erosion control matting (for slopes steeper than 3:1 or high wind prone areas). Erosion control matting is preferred.

☑Y ☐N The owner will contact DPW to schedule a stabilization inspection when site work is finished and stabilization measures (seeding and mulching or matting) have been installed.

AGREEMENT

By filling out and signing this plan, I agree to abide by the terms and conditions outlined above. Failure to follow this plan can result in a stop work order by the City of Burlington, fines, or both.

By: ☑ Owner ☐ Contractor ☐ Architect/Engineer

Name	Signature	Date

Additional Conditions of Approval:

Plan Approved by: _____ Date: _____
Megan J. Moir, CPESC, CPSWQ

Table of required DPW compliance verifications

Compliance Sign- off needed	Verified by	Date
Notification of start/ identification of EPSC coordinator		
Winter Stabilization Inspection (if applicable)		
Final Stabilization installed		

Appendix B

Water Quality Calculations

TRUDELL CONSULTING ENGINEERS

478 BLAIR PARK ROAD, WILLISTON, VT 05495 | 802.879.6331 | WWW.TCEVT.COM

Version: 9/06

For the area draining to*: SSDS

Located in drainage area for S/N: 001

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.57	acres
2	Impervious area		0.57	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	100.00	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.950	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.855	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.855	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	WQv =	0.041	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	WQv =	1781	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a **significant** use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a **significant** portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Water Quality Unit Sizing

Project #: 2010083-2

Date: 12/6/2012

Project Name: 110 Riverside Ave

Calculated By: LK

Treatment System: 1

Checked By: SMM

Pretreatment

Technology:	ADS Water Quality Unit	
Modified CN:	99.6	
Design Q:	1.11	cfs
ADS WQU Model #:	3620WQA	
Max Q for Model:	1.5	cfs

OK

Version: 9/06

For the area draining to*: SSDS

Located in drainage area for S/N: 001

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site area** draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.855 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.6 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

$$CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))$$

CN = 99.6

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

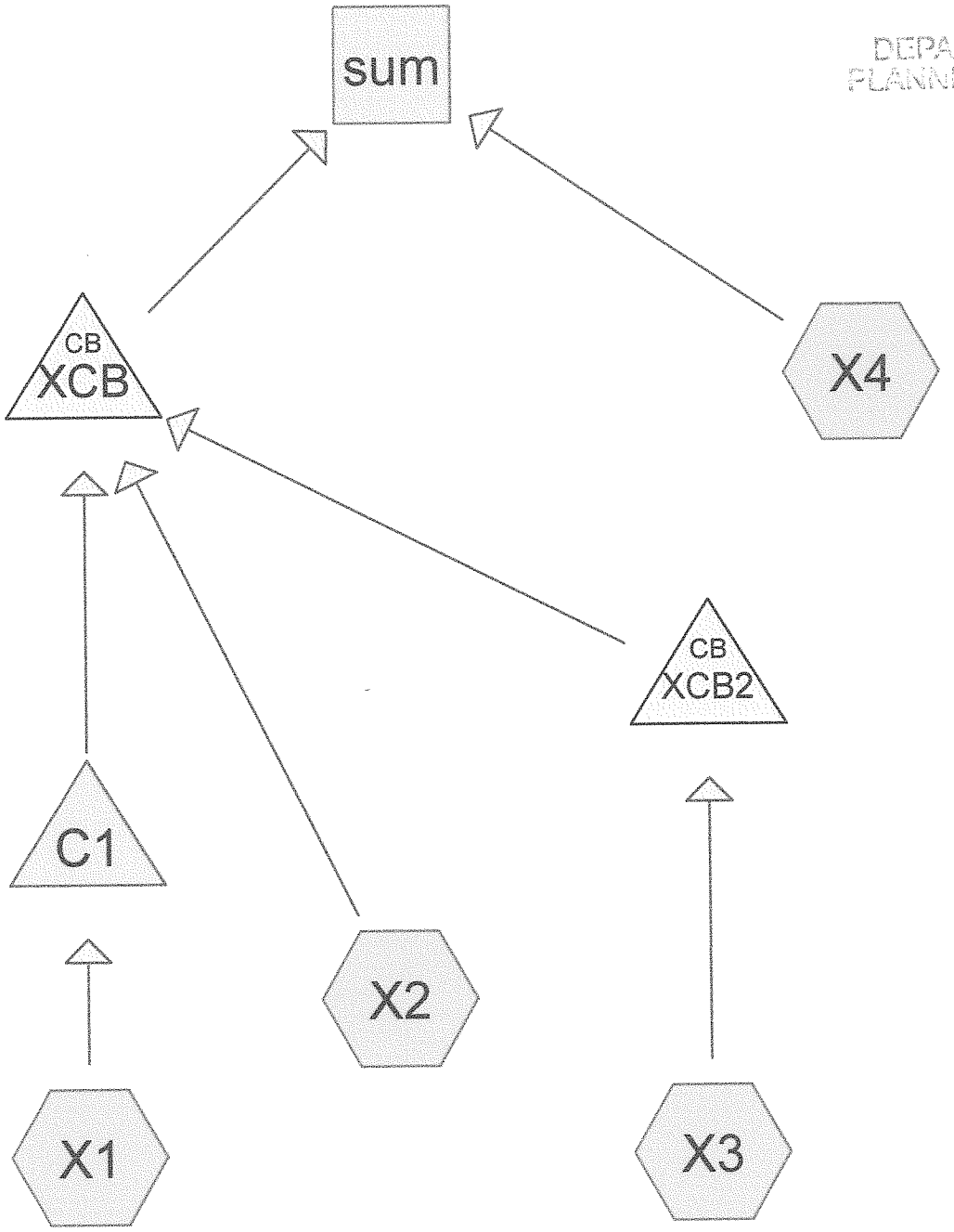
OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Appendix C

HydroCAD Modeling Results



Subcat Reach Pond Link

Routing Diagram for 2010083-2 - pre
Prepared by Trudell Consulting Engineers, Printed 12/6/2012
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.178	55.0	Woods, Good, HSG B (X1, X2, X3, X4)
0.125	61.0	>75% Grass cover, Good, HSG B (X2, X4)
0.652	98.0	Existing Impervious, HSG B (X2, X4)
5.955	**59.8**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.955	HSG B	X1, X2, X3, X4
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.955		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.652	0.000	0.000	0.000	0.652	Existing Impervious	X2, X4
0.000	0.125	0.000	0.000	0.000	0.125	>75% Grass cover, Good	X2, X4
0.000	5.178	0.000	0.000	0.000	5.178	Woods, Good	X1, X2, X3, X4
0.000	**5.955**	**0.000**	**0.000**	**0.000**	**5.955**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	C1	502.52	492.22	135.0	0.0763	0.013	12.0	0.0	0.0
2	XCB	489.33	476.00	175.0	0.0762	0.013	12.0	0.0	0.0
3	XCB2	499.46	490.32	142.0	0.0644	0.013	12.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Runoff Area=2.532 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=544' Tc=14.2 min CN=55.0 Runoff=0.01 cfs 0.005 af

Subcatchment X2: Runoff Area=0.686 ac 45.04% Impervious Runoff Depth=0.42"
Flow Length=450' Tc=17.4 min CN=74.8 Runoff=0.29 cfs 0.024 af

Subcatchment X3: Runoff Area=1.895 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=313' Tc=11.7 min CN=55.0 Runoff=0.01 cfs 0.004 af

Subcatchment X4: Runoff Area=0.842 ac 40.74% Impervious Runoff Depth=0.37"
Flow Length=191' Tc=10.9 min CN=73.0 Runoff=0.38 cfs 0.026 af

Reach sum: Inflow=0.63 cfs 0.059 af
Outflow=0.63 cfs 0.059 af

Pond C1: Peak Elev=502.56' Storage=0 cf Inflow=0.01 cfs 0.005 af
12.0" Round Culvert n=0.013 L=135.0' S=0.0763 '/' Outflow=0.01 cfs 0.005 af

Pond XCB: Peak Elev=489.61' Inflow=0.29 cfs 0.033 af
12.0" Round Culvert n=0.013 L=175.0' S=0.0762 '/' Outflow=0.29 cfs 0.033 af

Pond XCB2: Peak Elev=499.50' Inflow=0.01 cfs 0.004 af
12.0" Round Culvert n=0.013 L=142.0' S=0.0644 '/' Outflow=0.01 cfs 0.004 af

Total Runoff Area = 5.955 ac Runoff Volume = 0.059 af Average Runoff Depth = 0.12"
89.05% Pervious = 5.303 ac 10.95% Impervious = 0.652 ac

Summary for Subcatchment X1:

Runoff = 0.01 cfs @ 17.91 hrs, Volume= 0.005 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

Area (ac)	CN	Description
2.532	55.0	Woods, Good, HSG B
2.532		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1700	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	202	0.3550	1.49		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.1	242	0.0991	3.71	103.91	**Trap/Vee/Rect Channel Flow,** Bot.W=7.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=21.00' n= 0.150
14.2	544	Total			

Summary for Subcatchment X2:

Runoff = 0.29 cfs @ 12.12 hrs, Volume= 0.024 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
	0.324	55.0	Woods, Good, HSG B
*	0.309	98.0	Existing Impervious, HSG B
	0.053	61.0	>75% Grass cover, Good, HSG B
	0.686	74.8	Weighted Average
	0.377		54.96% Pervious Area
	0.309		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.3200	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
7.6	210	0.0343	0.46		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.4	140	0.0410	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
17.4	450	Total			

Summary for Subcatchment X3:

Runoff = 0.01 cfs @ 17.85 hrs, Volume= 0.004 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

Area (ac)	CN	Description
1.895	55.0	Woods, Good, HSG B
1.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.2400	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	213	0.3730	1.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
11.7	313	Total			

Summary for Subcatchment X4:

Runoff = 0.38 cfs @ 12.05 hrs, Volume= 0.026 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
	0.427	55.0	Woods, Good, HSG B
*	0.343	98.0	Existing Impervious, HSG B
	0.072	61.0	>75% Grass cover, Good, HSG B
	0.842	73.0	Weighted Average
	0.499		59.26% Pervious Area
	0.343		40.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	146	0.4080	0.24		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.6	45	0.0346	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
10.9	191	Total			

Summary for Reach sum:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.955 ac, 10.95% Impervious, Inflow Depth = 0.12" for 1-year event
Inflow = 0.63 cfs @ 12.07 hrs, Volume= 0.059 af
Outflow = 0.63 cfs @ 12.07 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond C1:

Inflow Area = 2.532 ac, 0.00% Impervious, Inflow Depth = 0.02" for 1-year event
Inflow = 0.01 cfs @ 17.91 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 17.88 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 17.88 hrs, Volume= 0.005 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Peak Elev= 502.56' @ 17.88 hrs Surf.Area= 3 sf Storage= 0 cf

Plug-Flow detention time= 0.1 min calculated for 0.005 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (1,143.7 - 1,143.5)

Volume	Invert	Avail.Storage	Storage Description
#1	502.52'	2,073 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.52	0	0	0
504.00	94	70	70
506.00	705	799	869
507.00	1,704	1,205	2,073

Device	Routing	Invert	Outlet Devices
#1	Primary	502.52'	**12.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 502.52' / 492.22' S= 0.0763 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 17.88 hrs HW=502.56' TW=489.41' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.01 cfs @ 0.56 fps)

Summary for Pond XCB:

Inflow Area = 5.113 ac, 6.04% Impervious, Inflow Depth = 0.08" for 1-year event
Inflow = 0.29 cfs @ 12.12 hrs, Volume= 0.033 af
Outflow = 0.29 cfs @ 12.12 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.12 hrs, Volume= 0.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 489.61' @ 12.12 hrs
Flood Elev= 496.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	489.33'	**12.0" Round Culvert** L= 175.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 489.33' / 476.00' S= 0.0762 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.12 hrs HW=489.61' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.29 cfs @ 1.60 fps)

Summary for Pond XCB2:

Inflow Area = 1.895 ac, 0.00% Impervious, Inflow Depth = 0.02" for 1-year event
Inflow = 0.01 cfs @ 17.85 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 17.85 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 17.85 hrs, Volume= 0.004 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 499.50' @ 17.85 hrs
Flood Elev= 502.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	499.46'	**12.0" Round Culvert** L= 142.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 499.46' / 490.32' S= 0.0644 '/' Cc= 0.900
n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 17.85 hrs HW=499.50' TW=489.41' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.01 cfs @ 0.52 fps)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment X1: Runoff Area=2.532 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=544' Tc=14.2 min CN=55.0 Runoff=0.33 cfs 0.053 af

Subcatchment X2: Runoff Area=0.686 ac 45.04% Impervious Runoff Depth=1.08"
Flow Length=450' Tc=17.4 min CN=74.8 Runoff=0.86 cfs 0.062 af

Subcatchment X3: Runoff Area=1.895 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=313' Tc=11.7 min CN=55.0 Runoff=0.28 cfs 0.040 af

Subcatchment X4: Runoff Area=0.842 ac 40.74% Impervious Runoff Depth=0.98"
Flow Length=191' Tc=10.9 min CN=73.0 Runoff=1.19 cfs 0.069 af

Reach sum: Inflow=2.47 cfs 0.223 af
Outflow=2.47 cfs 0.223 af

Pond C1: Peak Elev=502.84' Storage=3 cf Inflow=0.33 cfs 0.053 af
12.0" Round Culvert n=0.013 L=135.0' S=0.0763 '/' Outflow=0.33 cfs 0.053 af

Pond XCB: Peak Elev=490.02' Inflow=1.46 cfs 0.154 af
12.0" Round Culvert n=0.013 L=175.0' S=0.0762 '/' Outflow=1.46 cfs 0.154 af

Pond XCB2: Peak Elev=499.75' Inflow=0.28 cfs 0.040 af
12.0" Round Culvert n=0.013 L=142.0' S=0.0644 '/' Outflow=0.28 cfs 0.040 af

Total Runoff Area = 5.955 ac Runoff Volume = 0.223 af Average Runoff Depth = 0.45"
89.05% Pervious = 5.303 ac 10.95% Impervious = 0.652 ac

Summary for Subcatchment X1:

Runoff = 0.33 cfs @ 12.13 hrs, Volume= 0.053 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

Area (ac)	CN	Description
2.532	55.0	Woods, Good, HSG B
2.532		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1700	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	202	0.3550	1.49		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.1	242	0.0991	3.71	103.91	**Trap/Vee/Rect Channel Flow,** Bot.W=7.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=21.00' n= 0.150
14.2	544	Total			

Summary for Subcatchment X2:

Runoff = 0.86 cfs @ 12.11 hrs, Volume= 0.062 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	0.324	55.0	Woods, Good, HSG B
*	0.309	98.0	Existing Impervious, HSG B
	0.053	61.0	>75% Grass cover, Good, HSG B
	0.686	74.8	Weighted Average
	0.377		54.96% Pervious Area
	0.309		45.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.3200	0.20		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
7.6	210	0.0343	0.46		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.4	140	0.0410	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
17.4	450	Total			

Summary for Subcatchment X3:

Runoff = 0.28 cfs @ 12.10 hrs, Volume= 0.040 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

Area (ac)	CN	Description
1.895	55.0	Woods, Good, HSG B
1.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.2400	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.3	213	0.3730	1.53		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
11.7	313	Total			

Summary for Subcatchment X4:

Runoff = 1.19 cfs @ 12.04 hrs, Volume= 0.069 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	0.427	55.0	Woods, Good, HSG B
*	0.343	98.0	Existing Impervious, HSG B
	0.072	61.0	>75% Grass cover, Good, HSG B
	0.842	73.0	Weighted Average
	0.499		59.26% Pervious Area
	0.343		40.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	146	0.4080	0.24		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.6	45	0.0346	1.24		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
10.9	191	Total			

Summary for Reach sum:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.955 ac, 10.95% Impervious, Inflow Depth = 0.45" for 10-year event
Inflow = 2.47 cfs @ 12.08 hrs, Volume= 0.223 af
Outflow = 2.47 cfs @ 12.08 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond C1:

Inflow Area = 2.532 ac, 0.00% Impervious, Inflow Depth = 0.25" for 10-year event
Inflow = 0.33 cfs @ 12.13 hrs, Volume= 0.053 af
Outflow = 0.33 cfs @ 12.13 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.2 min
Primary = 0.33 cfs @ 12.13 hrs, Volume= 0.053 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Peak Elev= 502.84' @ 12.13 hrs Surf.Area= 20 sf Storage= 3 cf

Plug-Flow detention time= 0.2 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (964.3 - 964.1)

Volume	Invert	Avail.Storage	Storage Description
#1	502.52'	2,073 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.52	0	0	0
504.00	94	70	70
506.00	705	799	869
507.00	1,704	1,205	2,073

Device	Routing	Invert	Outlet Devices
#1	Primary	502.52'	**12.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 502.52' / 492.22' S= 0.0763 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.13 hrs HW=502.84' TW=490.02' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.33 cfs @ 1.52 fps)

Summary for Pond XCB:

Inflow Area = 5.113 ac, 6.04% Impervious, Inflow Depth = 0.36" for 10-year event
Inflow = 1.46 cfs @ 12.11 hrs, Volume= 0.154 af
Outflow = 1.46 cfs @ 12.11 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.11 hrs, Volume= 0.154 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 490.02' @ 12.11 hrs
Flood Elev= 496.32'

Device	Routing	Invert	Outlet Devices
#1	Primary	489.33'	**12.0" Round Culvert** L= 175.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 489.33' / 476.00' S= 0.0762 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.46 cfs @ 12.11 hrs HW=490.02' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.46 cfs @ 2.50 fps)

Summary for Pond XCB2:

Inflow Area = 1.895 ac, 0.00% Impervious, Inflow Depth = 0.25" for 10-year event
Inflow = 0.28 cfs @ 12.10 hrs, Volume= 0.040 af
Outflow = 0.28 cfs @ 12.10 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.10 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 499.75' @ 12.10 hrs
Flood Elev= 502.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	499.46'	**12.0" Round Culvert** L= 142.0' CMP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 499.46' / 490.32' S= 0.0644 '/' Cc= 0.900
n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.10 hrs HW=499.75' TW=490.02' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.28 cfs @ 1.46 fps)

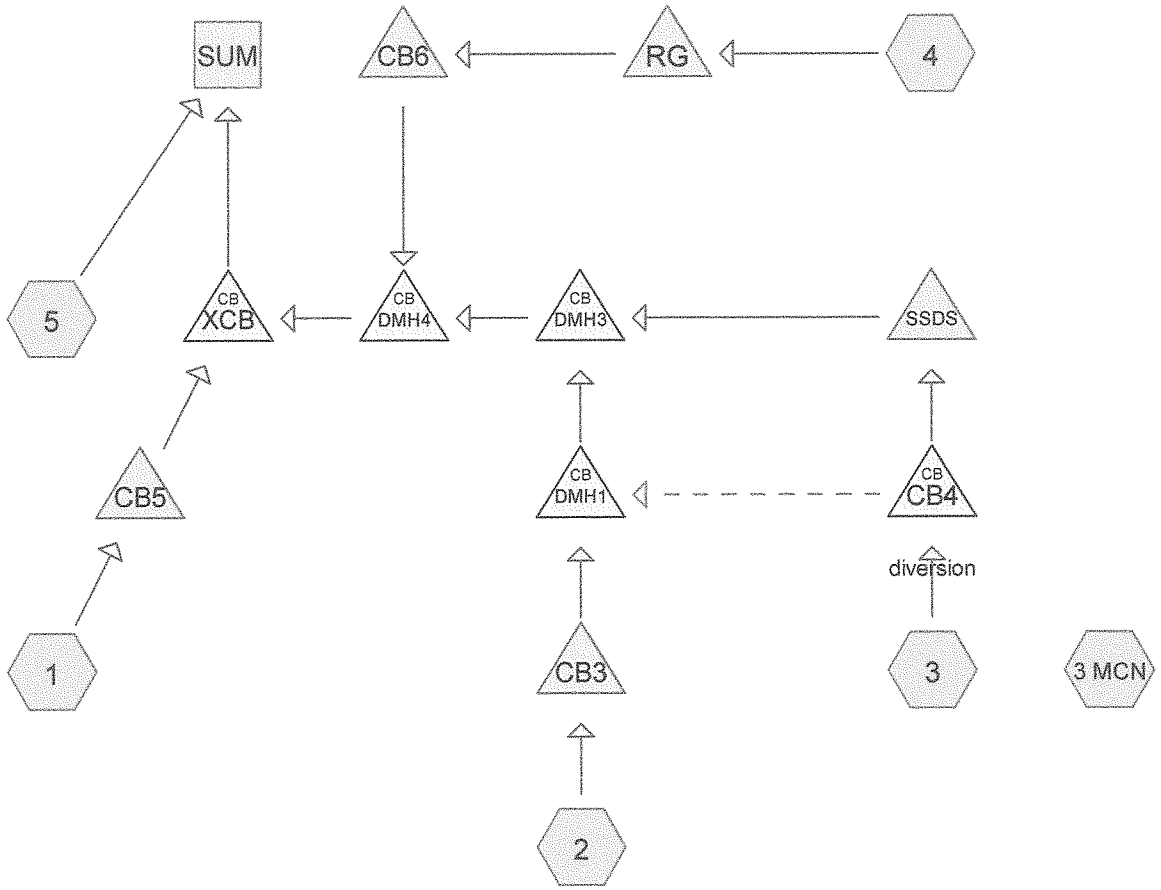
Summary for Subcatchment 3 MCN:

Runoff = 1.11 cfs @ 11.98 hrs, Volume= 0.064 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.905	99.6	mod CN
	0.905		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	98	0.4800	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.3	79	0.0366	3.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	177	Total			



Subcat Reach Pond Link

Routing Diagram for 2010083-2 - post 2012 1114
Prepared by Trudell Consulting Engineers, Printed 12/6/2012
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.820	55.0	Woods, Good, HSG B (1, 2, 3, 4)
0.402	61.0	>75% Grass cover, Good, HSG B (1, 2, 4, 5)
0.206	98.0	Proposed Impervious, HSG B (2, 4, 5)
0.094	98.0	Proposed Pavement, HSG C (3)
0.456	98.0	Proposed Roof, HSG B (3)
0.905	99.6	mod CN (3 MCN)
6.883	**65.9**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.884	HSG B	1, 2, 3, 4, 5
0.094	HSG C	3
0.000	HSG D	
0.905	Other	3 MCN
6.883		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.402	0.000	0.000	0.000	0.402	>75% Grass cover, Good	1, 2, 4, 5
0.000	0.206	0.000	0.000	0.000	0.206	Proposed Impervious	2, 4, 5
0.000	0.000	0.094	0.000	0.000	0.094	Proposed Pavement	3
0.000	0.456	0.000	0.000	0.000	0.456	Proposed Roof	3
0.000	4.820	0.000	0.000	0.000	4.820	Woods, Good	1, 2, 3, 4
0.000	0.000	0.000	0.000	0.905	0.905	mod CN	3 MCN
0.000	**5.884**	**0.094**	**0.000**	**0.905**	**6.883**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Runoff Area=2.447 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=505' Tc=13.1 min CN=55.1 Runoff=0.01 cfs 0.005 af

Subcatchment 2: Runoff Area=2.221 ac 2.88% Impervious Runoff Depth=0.04"
Flow Length=363' Tc=11.8 min CN=56.6 Runoff=0.01 cfs 0.007 af

Subcatchment 3: Runoff Area=0.905 ac 60.77% Impervious Runoff Depth=0.67"
Flow Length=177' Tc=7.3 min CN=81.1 Runoff=1.02 cfs 0.051 af

Subcatchment 3 MCN: Runoff Area=0.905 ac 100.00% Impervious Runoff Depth=2.05"
Flow Length=177' Tc=7.3 min CN=99.6 Runoff=2.61 cfs 0.155 af

Subcatchment 4: Runoff Area=0.177 ac 25.42% Impervious Runoff Depth=0.24"
Flow Length=171' Tc=7.6 min CN=68.6 Runoff=0.05 cfs 0.004 af

Subcatchment 5: Runoff Area=0.228 ac 42.54% Impervious Runoff Depth=0.49"
Flow Length=156' Tc=10.5 min CN=76.7 Runoff=0.16 cfs 0.009 af

Reach SUM: Inflow=0.51 cfs 0.073 af
Outflow=0.51 cfs 0.073 af

Pond CB3: Peak Elev=498.75' Storage=0 cf Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Pond CB4: diversion Peak Elev=495.03' Inflow=1.02 cfs 0.051 af
Primary=1.02 cfs 0.051 af Secondary=0.00 cfs 0.000 af Outflow=1.02 cfs 0.051 af

Pond CB5: Peak Elev=506.80' Storage=0 cf Inflow=0.01 cfs 0.005 af
Outflow=0.01 cfs 0.005 af

Pond CB6: Peak Elev=498.25' Storage=0 cf Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond DMH1: Peak Elev=493.69' Inflow=0.01 cfs 0.007 af
18.0" Round Culvert n=0.013 L=36.4' S=0.0577 '/' Outflow=0.01 cfs 0.007 af

Pond DMH3: Peak Elev=491.72' Inflow=0.37 cfs 0.058 af
18.0" Round Culvert n=0.013 L=81.0' S=0.0123 '/' Outflow=0.37 cfs 0.058 af

Pond DMH4: Peak Elev=490.64' Inflow=0.37 cfs 0.058 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0068 '/' Outflow=0.37 cfs 0.058 af

Pond RG: Peak Elev=499.45' Storage=92 cf Inflow=0.05 cfs 0.004 af
Discarded=0.00 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.004 af

Pond SSDS: Peak Elev=492.96' Storage=0.013 af Inflow=1.02 cfs 0.051 af
Outflow=0.37 cfs 0.051 af

Pond XCB: Peak Elev=489.59' Inflow=0.37 cfs 0.063 af
18.0" Round Culvert n=0.013 L=175.0' S=0.0761 '/' Outflow=0.37 cfs 0.063 af

Total Runoff Area = 6.883 ac Runoff Volume = 0.231 af Average Runoff Depth = 0.40"
75.87% Pervious = 5.222 ac 24.13% Impervious = 1.661 ac

Summary for Subcatchment 1:

Runoff = 0.01 cfs @ 17.80 hrs, Volume= 0.005 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

Area (ac)	CN	Description
2.405	55.0	Woods, Good, HSG B
0.042	61.0	>75% Grass cover, Good, HSG B
2.447	55.1	Weighted Average
2.447		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1700	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	200	0.3550	1.49		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.1	205	0.0991	37.11	1,039.08	**Trap/Vee/Rect Channel Flow,** Bot.W=7.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=21.00' n= 0.015
13.1	505	Total			

Summary for Subcatchment 2:

Runoff = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
	2.007	55.0	Woods, Good, HSG B
*	0.064	98.0	Proposed Impervious, HSG B
	0.150	61.0	>75% Grass cover, Good, HSG B
	2.221	56.6	Weighted Average
	2.157		97.12% Pervious Area
	0.064		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.1900	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.4	246	0.3290	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	17	0.4200	4.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	363	Total			

Summary for Subcatchment 3:

Runoff = 1.02 cfs @ 12.00 hrs, Volume= 0.051 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.456	98.0	Proposed Roof, HSG B
*	0.094	98.0	Proposed Pavement, HSG C
	0.355	55.0	Woods, Good, HSG B
	0.905	81.1	Weighted Average
	0.355		39.23% Pervious Area
	0.550		60.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	98	0.4800	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.3	79	0.0366	3.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	177	Total			

Summary for Subcatchment 3 MCN:

Runoff = 2.61 cfs @ 11.98 hrs, Volume= 0.155 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
*	0.905	99.6	mod CN
	0.905		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	98	0.4800	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.3	79	0.0366	3.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	177	Total			

Summary for Subcatchment 4:

Runoff = 0.05 cfs @ 12.02 hrs, Volume= 0.004 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
	0.053	55.0	Woods, Good, HSG B
	0.079	61.0	>75% Grass cover, Good, HSG B
*	0.045	98.0	Proposed Impervious, HSG B
	0.177	68.6	Weighted Average
	0.132		74.58% Pervious Area
	0.045		25.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.4470	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.2	54	0.0370	3.90		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.0290	2.55		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	171	Total			

Summary for Subcatchment 5:

Runoff = 0.16 cfs @ 12.04 hrs, Volume= 0.009 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-year Rainfall=2.10"

	Area (ac)	CN	Description
	0.131	61.0	>75% Grass cover, Good, HSG B
*	0.097	98.0	Proposed Impervious, HSG B
	0.228	76.7	Weighted Average
	0.131		57.46% Pervious Area
	0.097		42.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.6	44	0.0285	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	5	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	7	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.5	156	Total			

Summary for Reach SUM:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.978 ac, 12.65% Impervious, Inflow Depth = 0.15" for 1-year event
Inflow = 0.51 cfs @ 12.06 hrs, Volume= 0.073 af
Outflow = 0.51 cfs @ 12.06 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond CB3:

Inflow Area = 2.221 ac, 2.88% Impervious, Inflow Depth = 0.04" for 1-year event
Inflow = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 498.75' @ 15.17 hrs Surf.Area= 1 sf Storage= 0 cf
Flood Elev= 500.90' Surf.Area= 240 sf Storage= 244 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,096.7 - 1,096.7)

Volume	Invert	Avail.Storage	Storage Description
#1	498.75'	411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.75	0	0	0
500.00	127	79	79
501.50	315	332	411

Device	Routing	Invert	Outlet Devices
#1	Primary	494.75'	**18.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 494.75' / 493.75' S= 0.0222 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	498.75'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 15.17 hrs HW=498.75' TW=493.69' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.01 cfs of 15.35 cfs potential flow)
↑**2=CB Grate** (Weir Controls 0.01 cfs @ 0.23 fps)

Summary for Pond CB4: diversion

Inflow Area = 0.905 ac, 60.77% Impervious, Inflow Depth = 0.67" for 1-year event
Inflow = 1.02 cfs @ 12.00 hrs, Volume= 0.051 af
Outflow = 1.02 cfs @ 12.00 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.00 hrs, Volume= 0.051 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 495.03' @ 12.00 hrs
Flood Elev= 499.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	494.45'	**12.0" Round to storage** L= 31.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 494.45' / 494.20' S= 0.0080 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	495.45'	**18.0" Round overflow** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 495.45' / 495.25' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=1.02 cfs @ 12.00 hrs HW=495.03' TW=492.67' (Dynamic Tailwater)
└**1=to storage** (Barrel Controls 1.02 cfs @ 3.12 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=494.45' TW=493.65' (Dynamic Tailwater)
└**2=overflow** (Controls 0.00 cfs)

Summary for Pond CB5:

Inflow Area = 2.447 ac, 0.00% Impervious, Inflow Depth = 0.03" for 1-year event
Inflow = 0.01 cfs @ 17.80 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 17.80 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 17.80 hrs, Volume= 0.005 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 506.80' @ 17.80 hrs Surf.Area= 1 sf Storage= 0 cf
Flood Elev= 508.00' Surf.Area= 410 sf Storage= 243 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,139.5 - 1,139.5)

Volume	Invert	Avail.Storage	Storage Description
#1	506.80'	243 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
506.80	0	0	0
507.00	63	6	6
508.00	410	237	243

Device	Routing	Invert	Outlet Devices
#1	Primary	501.30'	**12.0" Round Culvert** L= 184.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 501.30' / 489.77' S= 0.0627 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	506.80'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 17.80 hrs HW=506.80' TW=489.40' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.01 cfs of 8.46 cfs potential flow)
└**2=CB Grate** (Weir Controls 0.01 cfs @ 0.21 fps)

Summary for Pond CB6:

Inflow Area = 0.177 ac, 25.42% Impervious, Inflow Depth = 0.00" for 1-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 498.25' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf
Flood Elev= 499.00' Surf.Area= 47 sf Storage= 18 cf

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	498.25'	18 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.25	0	0	0
499.00	47	18	18

Device	Routing	Invert	Outlet Devices
#1	Primary	492.75'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 492.75' / 490.45' S= 0.0920 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	498.25'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=498.25' TW=490.35' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.00 cfs of 8.46 cfs potential flow)
↑—**2=CB Grate** (Controls 0.00 cfs)

Summary for Pond DMH1:

Inflow Area = 2.221 ac, 2.88% Impervious, Inflow Depth = 0.04" for 1-year event
Inflow = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 15.17 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 493.69' @ 15.17 hrs
Flood Elev= 499.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	493.65'	**18.0" Round Culvert** L= 36.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 493.65' / 491.55' S= 0.0577 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.01 cfs @ 15.17 hrs HW=493.69' TW=491.54' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.01 cfs @ 0.69 fps)

Summary for Pond DMH3:

Inflow Area = 3.126 ac, 19.64% Impervious, Inflow Depth = 0.22" for 1-year event
Inflow = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af
Outflow = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 491.72' @ 12.12 hrs
Flood Elev= 501.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	491.45'	**18.0" Round Culvert** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 491.45' / 490.45' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.37 cfs @ 12.12 hrs HW=491.72' TW=490.64' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.37 cfs @ 1.76 fps)

Summary for Pond DMH4:

Inflow Area = 3.303 ac, 19.95% Impervious, Inflow Depth = 0.21" for 1-year event
Inflow = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af
Outflow = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.12 hrs, Volume= 0.058 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 490.64' @ 12.12 hrs
Flood Elev= 504.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	490.35'	**18.0" Round Culvert** L= 108.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 490.35' / 489.62' S= 0.0068 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.37 cfs @ 12.12 hrs HW=490.64' TW=489.59' (Dynamic Tailwater)
↳**1=Culvert** (Barrel Controls 0.37 cfs @ 2.37 fps)

Summary for Pond RG:

exfiltration rate based on VSMM values for bioretention soil (2.7.4.D)

Inflow Area = 0.177 ac, 25.42% Impervious, Inflow Depth = 0.24" for 1-year event
Inflow = 0.05 cfs @ 12.02 hrs, Volume= 0.004 af
Outflow = 0.00 cfs @ 23.78 hrs, Volume= 0.004 af, Atten= 97%, Lag= 705.4 min
Discarded = 0.00 cfs @ 23.78 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 499.45' @ 23.78 hrs Surf.Area= 266 sf Storage= 92 cf
Flood Elev= 500.50' Surf.Area= 470 sf Storage= 293 cf

Plug-Flow detention time= 718.4 min calculated for 0.004 af (100% of inflow)
Center-of-Mass det. time= 718.5 min (1,646.2 - 927.7)

Volume	Invert	Avail.Storage	Storage Description
#1	499.00'	293 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
499.00	144	0	0
499.50	279	106	106
500.00	470	187	293

Device	Routing	Invert	Outlet Devices
#1	Discarded	499.00'	**0.250 in/hr Exfiltration over Surface area**
#2	Primary	499.50'	**3.0' long x 6.0' breadth overflow spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.00 cfs @ 23.78 hrs HW=499.45' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=499.00' TW=498.25' (Dynamic Tailwater)
└**2=oveflow spillway** (Controls 0.00 cfs)

Summary for Pond SSDS:

Inflow Area = 0.905 ac, 60.77% Impervious, Inflow Depth = 0.67" for 1-year event
Inflow = 1.02 cfs @ 12.00 hrs, Volume= 0.051 af
Outflow = 0.37 cfs @ 12.12 hrs, Volume= 0.051 af, Atten= 64%, Lag= 7.3 min
Primary = 0.37 cfs @ 12.12 hrs, Volume= 0.051 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 492.96' @ 12.12 hrs Surf.Area= 0.014 ac Storage= 0.013 af
Flood Elev= 495.00' Surf.Area= 0.014 ac Storage= 0.040 af

Plug-Flow detention time= 32.3 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 32.1 min (892.7 - 860.6)

Volume	Invert	Avail.Storage	Storage Description
#1	492.00'	0.040 af	**20.00'W x 30.00'L x 3.00'H stormtank** 0.041 af Overall x 97.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	492.00'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 492.00' / 491.55' S= 0.0205 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	492.00'	**4.0" Vert. control orifice** C= 0.600
#3	Device 1	494.00'	**12.0" Vert. overflow culvert** C= 0.600

Primary OutFlow Max=0.37 cfs @ 12.12 hrs HW=492.96' TW=491.72' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.37 cfs of 2.57 cfs potential flow)
  ├**2=control orifice** (Orifice Controls 0.37 cfs @ 4.28 fps)
  └**3=overflow culvert** (Controls 0.00 cfs)

Summary for Pond XCB:

Inflow Area = 5.750 ac, 11.46% Impervious, Inflow Depth = 0.13" for 1-year event
Inflow = 0.37 cfs @ 12.12 hrs, Volume= 0.063 af
Outflow = 0.37 cfs @ 12.12 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.12 hrs, Volume= 0.063 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 489.59' @ 12.12 hrs
Flood Elev= 498.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	489.32'	**18.0" Round Culvert** L= 175.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.32' / 476.00' S= 0.0761 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.37 cfs @ 12.12 hrs HW=489.59' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.37 cfs @ 1.76 fps)

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Runoff Area=2.447 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=505' Tc=13.1 min CN=55.1 Runoff=0.35 cfs 0.052 af

Subcatchment 2: Runoff Area=2.221 ac 2.88% Impervious Runoff Depth=0.30"
Flow Length=363' Tc=11.8 min CN=56.6 Runoff=0.48 cfs 0.055 af

Subcatchment 3: Runoff Area=0.905 ac 60.77% Impervious Runoff Depth=1.48"
Flow Length=177' Tc=7.3 min CN=81.1 Runoff=2.28 cfs 0.111 af

Subcatchment 3 MCN: Runoff Area=0.905 ac 100.00% Impervious Runoff Depth=3.15"
Flow Length=177' Tc=7.3 min CN=99.6 Runoff=3.98 cfs 0.238 af

Subcatchment 4: Runoff Area=0.177 ac 25.42% Impervious Runoff Depth=0.76"
Flow Length=171' Tc=7.6 min CN=68.6 Runoff=0.21 cfs 0.011 af

Subcatchment 5: Runoff Area=0.228 ac 42.54% Impervious Runoff Depth=1.19"
Flow Length=156' Tc=10.5 min CN=76.7 Runoff=0.41 cfs 0.023 af

Reach SUM: Inflow=2.35 cfs 0.248 af
Outflow=2.35 cfs 0.248 af

Pond CB3: Peak Elev=498.82' Storage=0 cf Inflow=0.48 cfs 0.055 af
Outflow=0.48 cfs 0.055 af

Pond CB4: diversion Peak Elev=495.42' Inflow=2.28 cfs 0.111 af
Primary=2.28 cfs 0.111 af Secondary=0.00 cfs 0.000 af Outflow=2.28 cfs 0.111 af

Pond CB5: Peak Elev=506.86' Storage=0 cf Inflow=0.35 cfs 0.052 af
Outflow=0.35 cfs 0.052 af

Pond CB6: Peak Elev=498.28' Storage=0 cf Inflow=0.12 cfs 0.007 af
Outflow=0.12 cfs 0.007 af

Pond DMH1: Peak Elev=493.95' Inflow=0.48 cfs 0.055 af
18.0" Round Culvert n=0.013 L=36.4' S=0.0577 '/' Outflow=0.48 cfs 0.055 af

Pond DMH3: Peak Elev=492.02' Inflow=1.57 cfs 0.166 af
18.0" Round Culvert n=0.013 L=81.0' S=0.0123 '/' Outflow=1.57 cfs 0.166 af

Pond DMH4: Peak Elev=490.98' Inflow=1.68 cfs 0.173 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0068 '/' Outflow=1.68 cfs 0.173 af

Pond RG: Peak Elev=499.56' Storage=125 cf Inflow=0.21 cfs 0.011 af
Discarded=0.00 cfs 0.004 af Primary=0.12 cfs 0.007 af Outflow=0.12 cfs 0.011 af

Pond SSDS: Peak Elev=494.34' Storage=0.031 af Inflow=2.28 cfs 0.111 af
Outflow=1.08 cfs 0.111 af

Pond XCB: Peak Elev=489.97' Inflow=2.02 cfs 0.225 af
18.0" Round Culvert n=0.013 L=175.0' S=0.0761 '/' Outflow=2.02 cfs 0.225 af

Total Runoff Area = 6.883 ac Runoff Volume = 0.490 af Average Runoff Depth = 0.85"
75.87% Pervious = 5.222 ac 24.13% Impervious = 1.661 ac

Summary for Subcatchment 1:

Runoff = 0.35 cfs @ 12.12 hrs, Volume= 0.052 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

Area (ac)	CN	Description
2.405	55.0	Woods, Good, HSG B
0.042	61.0	>75% Grass cover, Good, HSG B
2.447	55.1	Weighted Average
2.447		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1700	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
2.2	200	0.3550	1.49		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.1	205	0.0991	37.11	1,039.08	**Trap/Vee/Rect Channel Flow,** Bot.W=7.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=21.00' n= 0.015
13.1	505	Total			

Summary for Subcatchment 2:

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	2.007	55.0	Woods, Good, HSG B
*	0.064	98.0	Proposed Impervious, HSG B
	0.150	61.0	>75% Grass cover, Good, HSG B
	2.221	56.6	Weighted Average
	2.157		97.12% Pervious Area
	0.064		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.1900	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.4	246	0.3290	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	17	0.4200	4.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	363	Total			

Summary for Subcatchment 3:

Runoff = 2.28 cfs @ 11.99 hrs, Volume= 0.111 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.456	98.0	Proposed Roof, HSG B
*	0.094	98.0	Proposed Pavement, HSG C
	0.355	55.0	Woods, Good, HSG B
	0.905	81.1	Weighted Average
	0.355		39.23% Pervious Area
	0.550		60.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	98	0.4800	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.3	79	0.0366	3.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	177	Total			

Summary for Subcatchment 3 MCN:

Runoff = 3.98 cfs @ 11.98 hrs, Volume= 0.238 af, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.905	99.6	mod CN
	0.905		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	98	0.4800	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.3	79	0.0366	3.88		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	177	Total			

Summary for Subcatchment 4:

Runoff = 0.21 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	0.053	55.0	Woods, Good, HSG B
	0.079	61.0	>75% Grass cover, Good, HSG B
*	0.045	98.0	Proposed Impervious, HSG B
	0.177	68.6	Weighted Average
	0.132		74.58% Pervious Area
	0.045		25.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.4470	0.23		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.2	54	0.0370	3.90		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.0290	2.55		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	171	Total			

Summary for Subcatchment 5:

Runoff = 0.41 cfs @ 12.03 hrs, Volume= 0.023 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	0.131	61.0	>75% Grass cover, Good, HSG B
*	0.097	98.0	Proposed Impervious, HSG B
	0.228	76.7	Weighted Average
	0.131		57.46% Pervious Area
	0.097		42.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	100	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.6	44	0.0285	1.18		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	5	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	7	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.5	156	Total			

Summary for Reach SUM:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.978 ac, 12.65% Impervious, Inflow Depth = 0.50" for 10-year event
Inflow = 2.35 cfs @ 12.09 hrs, Volume= 0.248 af
Outflow = 2.35 cfs @ 12.09 hrs, Volume= 0.248 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond CB3:

Inflow Area = 2.221 ac, 2.88% Impervious, Inflow Depth = 0.30" for 10-year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 498.82' @ 12.09 hrs Surf.Area= 7 sf Storage= 0 cf
Flood Elev= 500.90' Surf.Area= 240 sf Storage= 244 cf

Plug-Flow detention time= 0.0 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (948.3 - 948.3)

Volume	Invert	Avail.Storage	Storage Description
#1	498.75'	411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.75	0	0	0
500.00	127	79	79
501.50	315	332	411

Device	Routing	Invert	Outlet Devices
#1	Primary	494.75'	**18.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 494.75' / 493.75' S= 0.0222 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	498.75'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.48 cfs @ 12.09 hrs HW=498.82' TW=493.95' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.48 cfs of 15.50 cfs potential flow)
└**2=CB Grate** (Weir Controls 0.48 cfs @ 0.87 fps)

Summary for Pond CB4: diversion

Inflow Area = 0.905 ac, 60.77% Impervious, Inflow Depth = 1.48" for 10-year event
Inflow = 2.28 cfs @ 11.99 hrs, Volume= 0.111 af
Outflow = 2.28 cfs @ 11.99 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 11.99 hrs, Volume= 0.111 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 495.42' @ 11.99 hrs
Flood Elev= 499.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	494.45'	**12.0" Round to storage** L= 31.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 494.45' / 494.20' S= 0.0080 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Secondary	495.45'	**18.0" Round overflow** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 495.45' / 495.25' S= 0.0400 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=2.28 cfs @ 11.99 hrs HW=495.42' TW=493.71' (Dynamic Tailwater)
└**1=to storage** (Barrel Controls 2.28 cfs @ 3.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=494.45' TW=493.65' (Dynamic Tailwater)
└**2=overflow** (Controls 0.00 cfs)

Summary for Pond CB5:

Inflow Area = 2.447 ac, 0.00% Impervious, Inflow Depth = 0.25" for 10-year event
Inflow = 0.35 cfs @ 12.12 hrs, Volume= 0.052 af
Outflow = 0.35 cfs @ 12.12 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.12 hrs, Volume= 0.052 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 506.86' @ 12.12 hrs Surf.Area= 18 sf Storage= 0 cf
Flood Elev= 508.00' Surf.Area= 410 sf Storage= 243 cf

Plug-Flow detention time= 0.0 min calculated for 0.052 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (962.2 - 962.2)

Volume	Invert	Avail.Storage	Storage Description
#1	506.80'	243 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
506.80	0	0	0
507.00	63	6	6
508.00	410	237	243

Device	Routing	Invert	Outlet Devices
#1	Primary	501.30'	**12.0" Round Culvert** L= 184.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 501.30' / 489.77' S= 0.0627 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	506.80'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.35 cfs @ 12.12 hrs HW=506.86' TW=489.96' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.35 cfs of 8.50 cfs potential flow)
└**2=CB Grate** (Weir Controls 0.35 cfs @ 0.78 fps)

Summary for Pond CB6:

Inflow Area = 0.177 ac, 25.42% Impervious, Inflow Depth = 0.48" for 10-year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 0.007 af
Outflow = 0.12 cfs @ 12.09 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.09 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 498.28' @ 12.09 hrs Surf.Area= 2 sf Storage= 0 cf
Flood Elev= 499.00' Surf.Area= 47 sf Storage= 18 cf

Plug-Flow detention time= 0.0 min calculated for 0.007 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (893.3 - 893.3)

Volume	Invert	Avail.Storage	Storage Description
#1	498.25'	18 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.25	0	0	0
499.00	47	18	18

Device	Routing	Invert	Outlet Devices
#1	Primary	492.75'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 492.75' / 490.45' S= 0.0920 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	498.25'	**2.0" x 2.0" Horiz. CB Grate X 7.00 columns** X 7 rows C= 0.600 in 23.9" x 23.9" Grate Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 12.09 hrs HW=498.28' TW=490.98' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.12 cfs of 8.48 cfs potential flow)
↑**2=CB Grate** (Weir Controls 0.12 cfs @ 0.54 fps)

Summary for Pond DMH1:

Inflow Area = 2.221 ac, 2.88% Impervious, Inflow Depth = 0.30" for 10-year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.09 hrs, Volume= 0.055 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 493.95' @ 12.09 hrs
Flood Elev= 499.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	493.65'	**18.0" Round Culvert** L= 36.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 493.65' / 491.55' S= 0.0577 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.48 cfs @ 12.09 hrs HW=493.95' TW=492.02' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.48 cfs @ 1.88 fps)

Summary for Pond DMH3:

Inflow Area = 3.126 ac, 19.64% Impervious, Inflow Depth = 0.64" for 10-year event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 0.166 af
Outflow = 1.57 cfs @ 12.09 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.09 hrs, Volume= 0.166 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 492.02' @ 12.09 hrs
Flood Elev= 501.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	491.45'	**18.0" Round Culvert** L= 81.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 491.45' / 490.45' S= 0.0123 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=1.57 cfs @ 12.09 hrs HW=492.02' TW=490.98' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.57 cfs @ 2.56 fps)

Summary for Pond DMH4:

Inflow Area = 3.303 ac, 19.95% Impervious, Inflow Depth = 0.63" for 10-year event
Inflow = 1.68 cfs @ 12.09 hrs, Volume= 0.173 af
Outflow = 1.68 cfs @ 12.09 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min
Primary = 1.68 cfs @ 12.09 hrs, Volume= 0.173 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 490.98' @ 12.09 hrs
Flood Elev= 504.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	490.35'	**18.0" Round Culvert** L= 108.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 490.35' / 489.62' S= 0.0068 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=1.68 cfs @ 12.09 hrs HW=490.98' TW=489.97' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.68 cfs @ 3.52 fps)

Summary for Pond RG:

exfiltration rate based on VSMM values for bioretention soil (2.7.4.D)

Inflow Area = 0.177 ac, 25.42% Impervious, Inflow Depth = 0.76" for 10-year event
Inflow = 0.21 cfs @ 12.00 hrs, Volume= 0.011 af
Outflow = 0.12 cfs @ 12.09 hrs, Volume= 0.011 af, Atten= 44%, Lag= 5.3 min
Discarded = 0.00 cfs @ 12.09 hrs, Volume= 0.004 af
Primary = 0.12 cfs @ 12.09 hrs, Volume= 0.007 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 499.56' @ 12.09 hrs Surf.Area= 304 sf Storage= 125 cf
Flood Elev= 500.50' Surf.Area= 470 sf Storage= 293 cf

Plug-Flow detention time= 302.9 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 303.1 min (1,182.4 - 879.4)

Volume	Invert	Avail.Storage	Storage Description
#1	499.00'	293 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
499.00	144	0	0
499.50	279	106	106
500.00	470	187	293

Device	Routing	Invert	Outlet Devices
#1	Discarded	499.00'	**0.250 in/hr Exfiltration over Surface area**
#2	Primary	499.50'	**3.0' long x 6.0' breadth overflow spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.00 cfs @ 12.09 hrs HW=499.56' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.12 cfs @ 12.09 hrs HW=499.56' TW=498.28' (Dynamic Tailwater)
└**2=oveflow spillway** (Weir Controls 0.12 cfs @ 0.60 fps)

Summary for Pond SSDS:

Inflow Area = 0.905 ac, 60.77% Impervious, Inflow Depth = 1.48" for 10-year event
Inflow = 2.28 cfs @ 11.99 hrs, Volume= 0.111 af
Outflow = 1.08 cfs @ 12.09 hrs, Volume= 0.111 af, Atten= 52%, Lag= 6.0 min
Primary = 1.08 cfs @ 12.09 hrs, Volume= 0.111 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 494.34' @ 12.09 hrs Surf.Area= 0.014 ac Storage= 0.031 af
Flood Elev= 495.00' Surf.Area= 0.014 ac Storage= 0.040 af

Plug-Flow detention time= 28.9 min calculated for 0.111 af (100% of inflow)
Center-of-Mass det. time= 29.1 min (866.2 - 837.2)

Volume	Invert	Avail.Storage	Storage Description
#1	492.00'	0.040 af	**20.00'W x 30.00'L x 3.00'H stormtank** 0.041 af Overall x 97.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	492.00'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 492.00' / 491.55' S= 0.0205 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	492.00'	**4.0" Vert. control orifice** C= 0.600
#3	Device 1	494.00'	**12.0" Vert. overflow culvert** C= 0.600

Primary OutFlow Max=1.08 cfs @ 12.09 hrs HW=494.34' TW=492.02' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.08 cfs of 5.13 cfs potential flow)
  ├**2=control orifice** (Orifice Controls 0.62 cfs @ 7.10 fps)
  └**3=overflow culvert** (Orifice Controls 0.46 cfs @ 1.98 fps)

Summary for Pond XCB:

Inflow Area = 5.750 ac, 11.46% Impervious, Inflow Depth = 0.47" for 10-year event
Inflow = 2.02 cfs @ 12.09 hrs, Volume= 0.225 af
Outflow = 2.02 cfs @ 12.09 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min
Primary = 2.02 cfs @ 12.09 hrs, Volume= 0.225 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 489.97' @ 12.09 hrs
Flood Elev= 498.75'

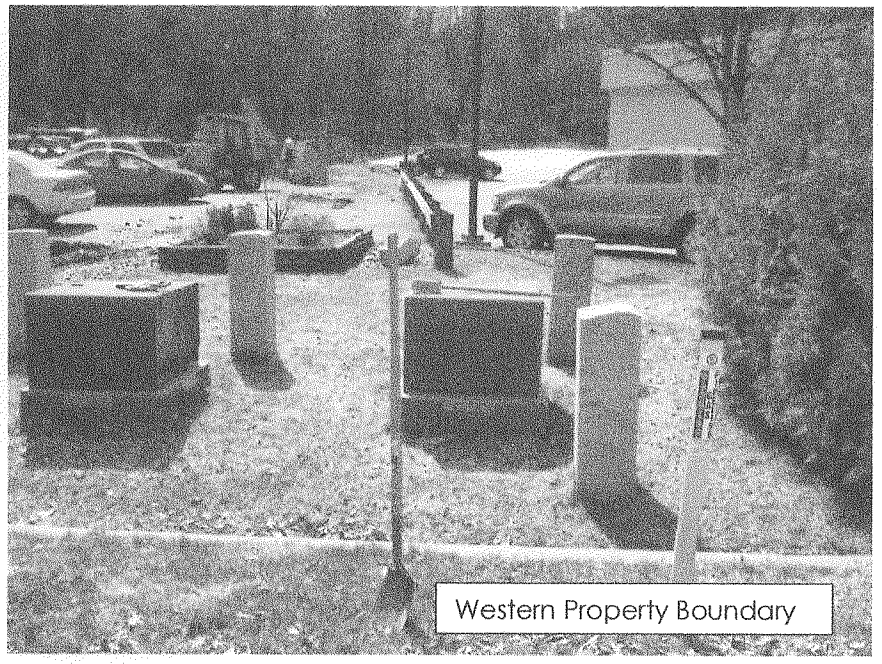
Device	Routing	Invert	Outlet Devices
#1	Primary	489.32'	**18.0" Round Culvert** L= 175.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.32' / 476.00' S= 0.0761 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=2.02 cfs @ 12.09 hrs HW=489.97' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.02 cfs @ 2.75 fps)

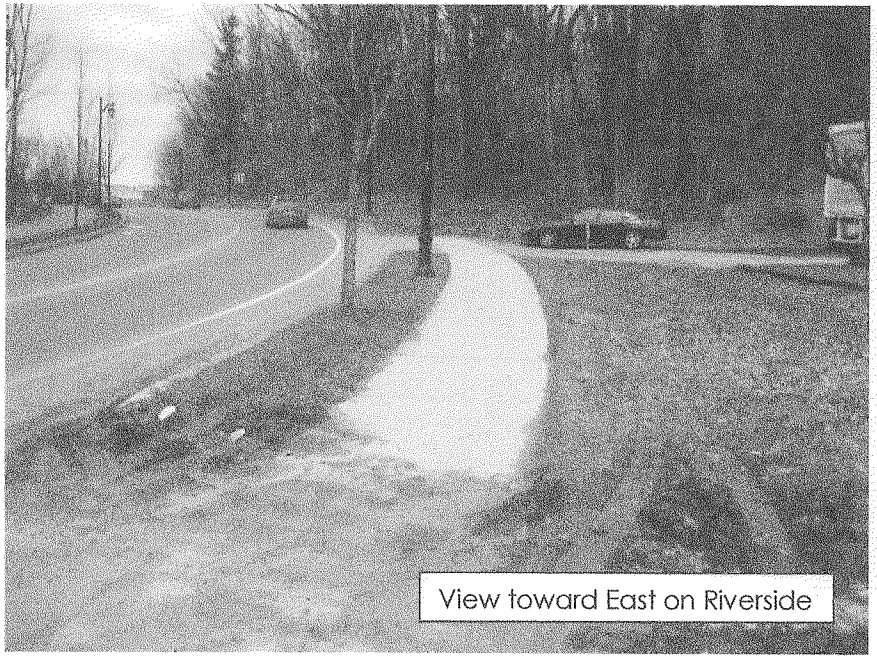
Project Photographs – Existing Conditions

110 Riverside Ave, Burlington, VT

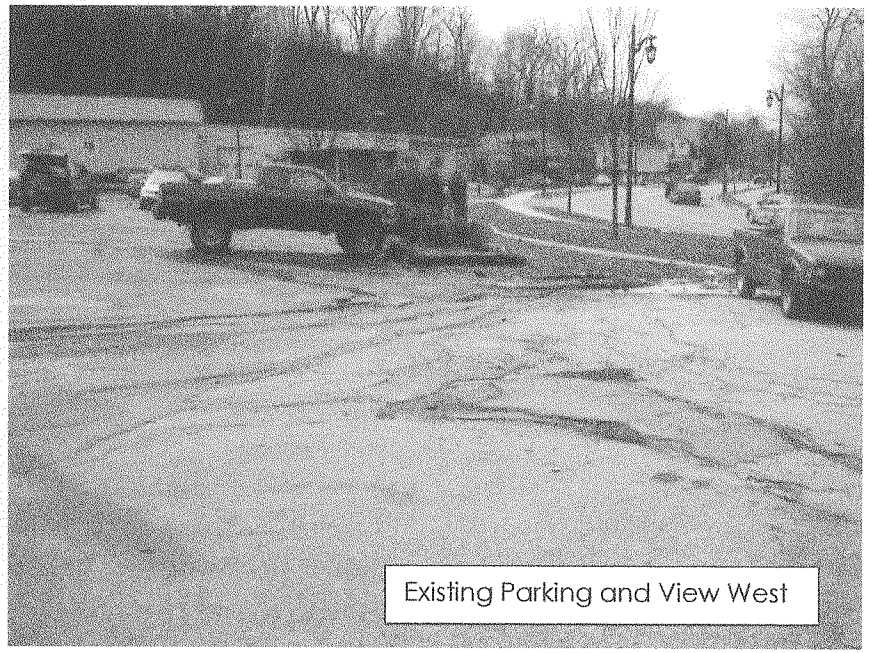
Front View of Existing Building



Western Property Boundary



View toward East on Riverside



Existing Parking and View West

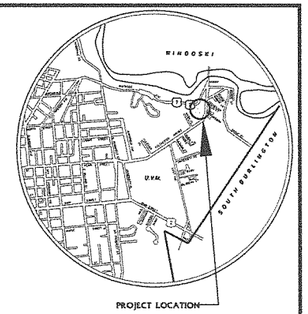
BURLINGTON CITY CLERK'S OFFICE
RECEIVED FOR RECORD

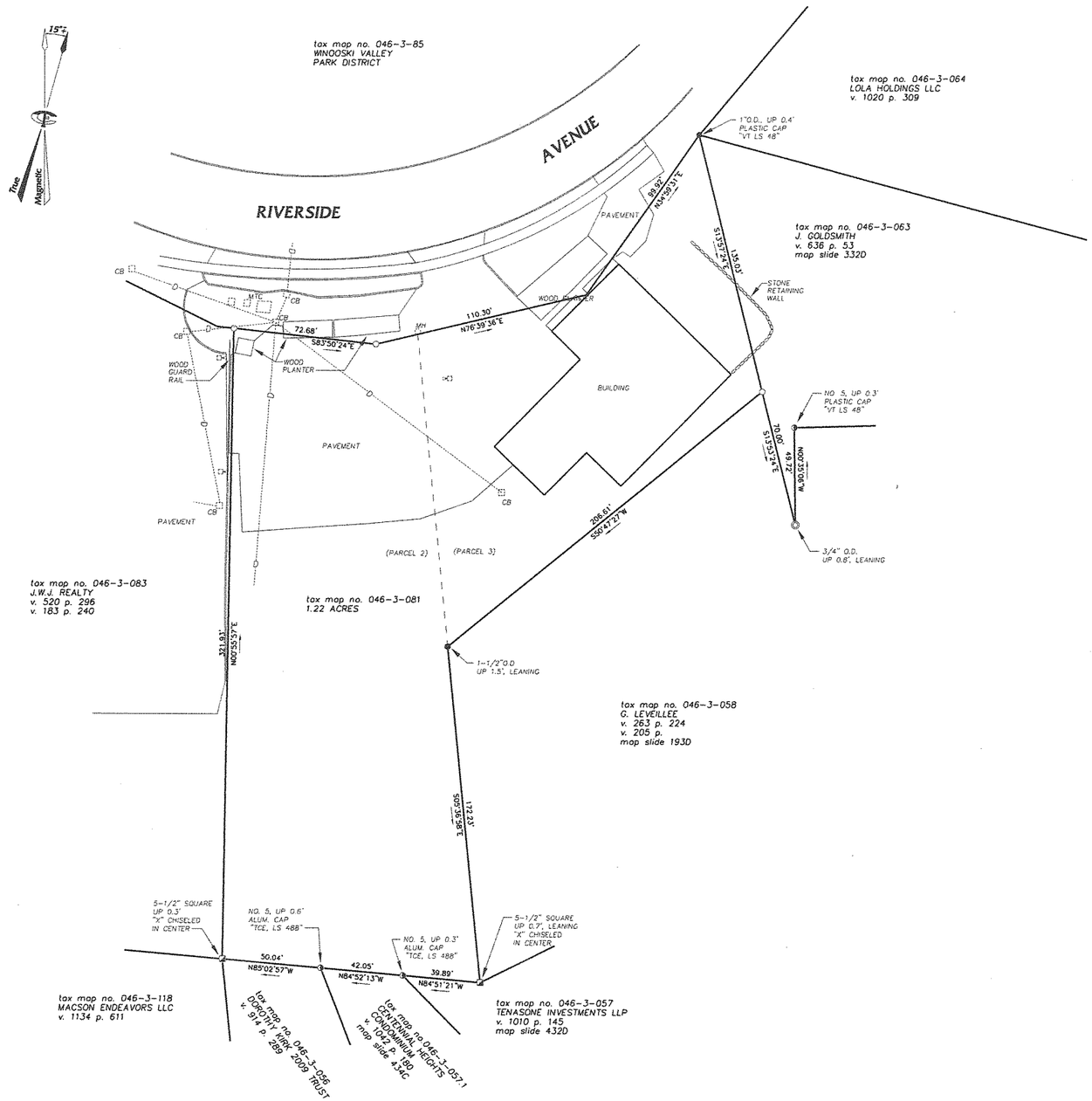
_____A.D. 201___

at _____ O'clock _____ minutes _____ m

and recorded in plat hanger # _____

Attest: _____ City Clerk





Graphic Scale

30 0 30 60 90 120 Feet

NOTES:

1) THIS PLAT IS BASED ON DEEDS RESEARCHED IN THE CITY OF BURLINGTON LAND RECORDS AND A CLOSED FIELD TRAVERSE CONDUCTED WITH A TOTAL STATION ON 4/15/11. BEARINGS ARE BASED ON MAGNETIC NORTH TAKEN ALONG A LEG OF THE TRAVERSE.
2) REBARS SET ARE NO. 5 REINFORCING BARS WITH ALUMINUM CAPS STAMPED "TRUDELL CONSULTING ENGINEERS, LS 488".
3) THIS LAND WAS CONVEYED TO SISTERS AND BROTHERS INVESTMENT GROUP, LLP IN VOLUME 668 PAGE 171 AND SHOWN ON A PLAT ENTITLED "PROPERTY PLAN, MRS. FRANCIS LEVEILLEE" WHICH IS RECORDED IN VOLUME 183 PAGE 240.
4) DISTANCES ARE SHOWN TO THE HUNDREDTH OF A FOOT AND BEARINGS ARE SHOWN TO THE SECOND FOR MATHEMATICAL CLOSURE PURPOSES ONLY.
5) AN ATTEMPT HAS BEEN MADE TO IDENTIFY OR DELINEATE EASEMENTS, RIGHTS OF WAY, LEASE LANDS, ENCROACHMENTS, ETC. OBSERVED IN THE FIELD OR READILY FOUND IN THE LAND RECORDS. ADDITIONAL ENCUMBRANCES MAY EXIST WHICH ARE NOT SHOWN ON THIS PLAT.
6) UNDERGROUND UTILITY LINES SHOWN ARE BASED ON ABOVE GROUND STRUCTURES AND PLANS OF RECORD. ACTUAL LOCATION OF UNDERGROUND LINES MAY VARY.

LEGEND

- REBAR (TO BE SET)
- IRON PIPE (FOUND)
- CONCRETE MONUMENT (FOUND)
- CONCRETE MONUMENT (TO BE SET)
- IRON PIN (FOUND)
- REINFORCING BAR (FOUND)
- MARBLE MONUMENT (FOUND)
- CALCULATED POINT
- UTILITY POLE
- OVERHEAD UTILITY LINES
- BARBED WIRE FENCE
- STONE WALL
- C1 CURVE DATA TABLE REFERENCE
- L1 LINE DATA TABLE REFERENCE

STATE OF VERMONT
SCOTT D. TAYLOR
NO. 488
LICENSED
LAND SURVEYOR

Revisions		Description	Date	By

Boundary Plat
SISTERS & BROTHERS INVESTMENT GROUP
110 Riverside Avenue
Burlington, Vermont

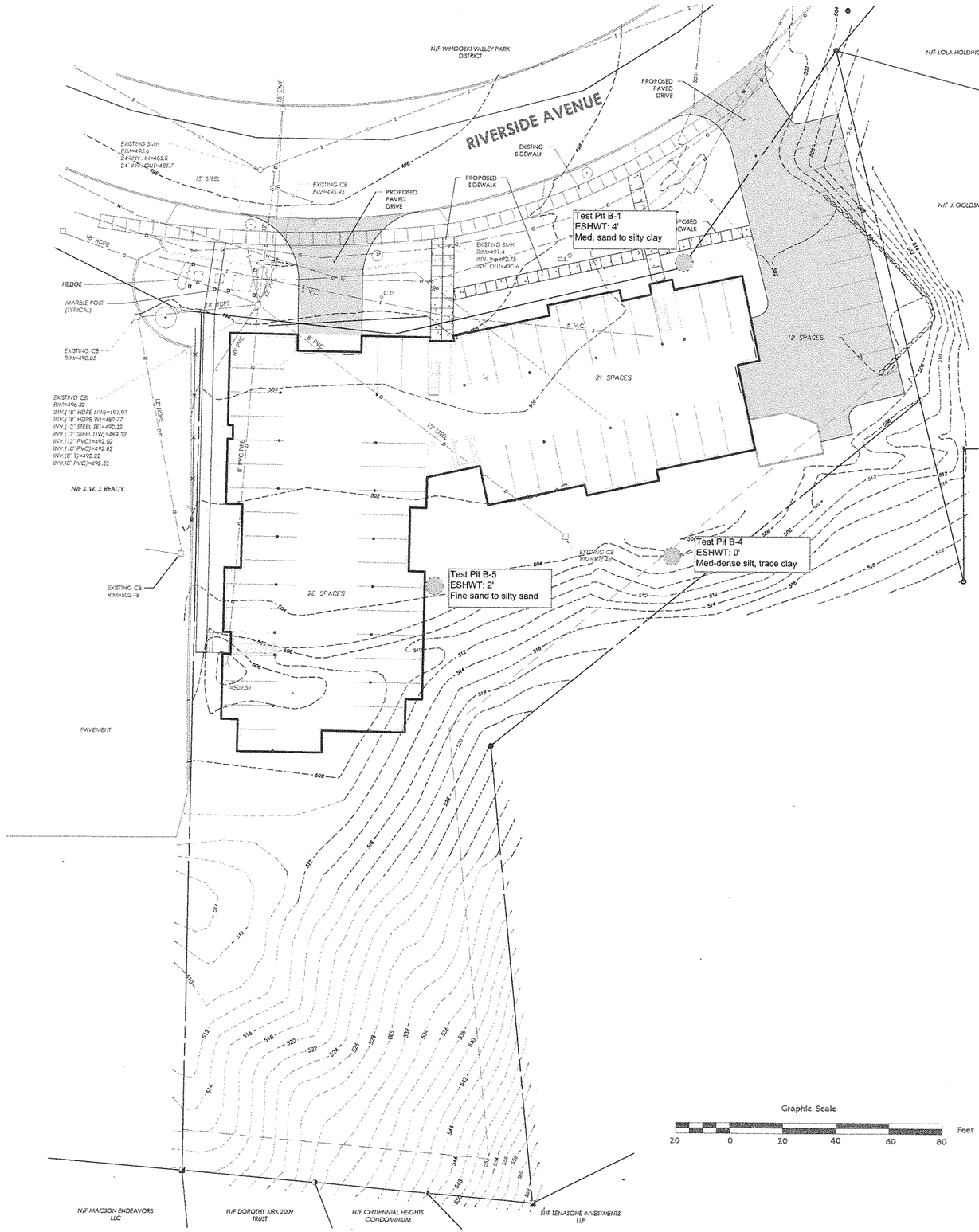
TRUDELL CONSULTING ENGINEERS (TCE)
478 Blair Park Road P. O. Box 308 Williston, Vermont 05495 (802) 879-6331

Drawing number 2010063-40 Ext. 1
Project mgr. JMM Drawn SDT
Date 11/21/2012 Scale 1"=30'
Field Book 225 Disk jobs10/3
Approved

DRAFT

Field book:

Project Reference:



Graphic Scale

20 0 20 40 60 80 Feet

DRAFT

DRAFT

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802 879 6331 |
WWW.TCEVT.COM

Revisions

No.	Description	Date	By

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DRAFT

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave. Burlington, Vermont

Sheet Title

Soil Boring Plan

Date:	8/8/2012
Scale:	1" = 20'
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

DRAFT

Field Book:

Project Reference:

LEGEND

LINE

	EXISTING	PROPOSED	REMOVED/ABANDONED
SITE			
PAVED DRIVE OR ROAD			
GRAVEL DRIVE OR ROAD			
PAVED DRIVE OR ROAD WITH CURB			
TREE LINE			
TRAIL			
WETLAND LIMIT			
TOPOGRAPHIC CONTOURS	124	124	
STREAM			
SILT FENCE			
UTILITIES			
SEWER MAINS AND SERVICES			
SEWER FORCEMAIN			
WATER MAINS AND SERVICES			
STORM DRAINAGE			
CURTAIN DRAIN			
UNDERDRAIN			
ROOF DRAIN			
FOOTING DRAIN			
LIQUID PROPANE OR NATURAL GAS			
OVERHEAD POWER			
UNDERGROUND POWER			
OVERHEAD TELEPHONE			
UNDERGROUND TELEPHONE			
OVERHEAD POWER & TELEPHONE			
UNDERGROUND POWER & TELEPHONE			
OVERHEAD POWER, TELEPHONE & CABLE			
UNDERGROUND POWER, TELEPHONE & CABLE			
CABLE TELEVISION			
FIBER OPTIC			
SURVEY			
PROPERTY LINE			
RIGHT-OF-WAY LINE			
EASEMENTS			
STONEWALL			
FENCE	x	x	x
BUILDING SETBACKS			

SYMBOL

	EXISTING	PROPOSED	REMOVED/ABANDONED
SITE			
SIGN			
WETLAND FLAG			
UTILITIES			
SEWER MANHOLE (SMH)			
SEWER CLEANOUT (CO)			
PUMP STATION (PS)			
STORM DRAINAGE MANHOLE (DMH)			
CATCH BASIN (CB)			
STORM DRAINAGE CLEANOUT			
OUTLET OR END SECTION			
VALVE			
CURB STOP (CS)			
FIRE HYDRANT (HYD)			
WATER SUPPLY WELL			
END CAP			
BLOWOFF			
UTILITY POLE			
MTC OR TRANSFORMER			
TELEPHONE MANHOLE			
TELEPHONE PEDESTAL			
LUMINAIRE			
BOLLARD LIGHT			
TELEVISION PEDESTAL			
FIELD			
CALCULATED POINT			
TCE CONTROL POINT STEEL REBAR			
TCE CONTROL POINT PK NAIL			
OBSERVATION WELL			
PERCOLATION TEST			
SOIL TEST PIT			
SOIL BORING			
BENCHMARK			

SURVEY	FOUND	TO BE SET	SET

CONSTRUCTION NOTES:

1. CONTRACT DOCUMENTS:THESE PLANS WERE PREPARED BY TRUDELL CONSULTING ENGINEERS (TCE) AND ARE INTENDED TO BE USED IN CONJUNCTION WITH THE STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT, #C-700 PREPARED BY THE ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE (EJCDC), LATEST EDITION. COPIES ARE AVAILABLE AT WWW.NSPE.ORG/EJCDC
2. UNDERGROUND IMPROVEMENTS: THE LOCATION OF EXISTING UNDERGROUND UTILITIES AND IMPROVEMENTS SHOWN ARE ASSUMED BASED ON RESEARCH, UTILITY PLANS PROVIDED BY OTHERS, AND/OR SURFACE EVIDENCE AVAILABLE AND WERE OBTAINED IN A MANNER CONSISTENT WITH THE ORDINARY STANDARD OF PROFESSIONAL CARE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR THE DESIGN ENGINEER.
3. DIFFERING SUBSURFACE OR PHYSICAL CONDITIONS: IF CONTRACTOR BELIEVES THAT ANY SUBSURFACE OR PHYSICAL CONDITION AT OR CONTIGUOUS TO THE SITE THAT IS UNCOVERED OR REVEALED EITHER: (1) IS OF SUCH A NATURE AS TO ESTABLISH THAT ANY "TECHNICAL DATA" ON WHICH CONTRACTOR RELIED IS MATERIALLY INACCURATE; OR (2) IS OF SUCH A NATURE AS TO REQUIRE A CHANGE IN THE PLANS/ CONTRACT DOCUMENTS; OR (3) DIFFERS MATERIALLY FROM THAT SHOWN OR INDICATED IN THE PLANS/CONTRACT DOCUMENTS; OR (4) IS OF AN UNUSUAL NATURE, AND DIFFERS MATERIALLY FROM CONDITIONS ORDINARILY ENCOUNTERED AND GENERALLY RECOGNIZED AS INHERENT IN WORK OF THE CHARACTER PROVIDED FOR IN THE PLANS/CONTRACT DOCUMENTS; THEN CONTRACTOR SHALL PROMPTLY AFTER BECOMING AWARE THEREOF AND BEFORE FURTHER DISTURBING THE SUBSURFACE OR PHYSICAL CONDITIONS OR PERFORMING ANY WORK IN CONNECTION THEREWITH (EXCEPT IN AN EMERGENCY), NOTIFY OWNER AND ENGINEER ABOUT SUCH CONDITION. CONTRACTOR SHALL NOT FURTHER DISTURB SUCH CONDITION OR PERFORM ANY WORK IN CONNECTION THEREWITH (EXCEPT AS AFORESAID) UNTIL RECEIPT OF WRITTEN ORDER TO DO SO.
4. UTILITIES: PRIVATE AND PUBLIC UTILITIES SUCH AS ELECTRIC, TELEPHONE, GAS, CABLE FIBER OPTIC ETC. ARE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY. ANY INFORMATION SHOWN BY TCE SHOULD BE CONSIDERED PRELIMINARY (USUALLY TO ASSIST WITH PERMITTING). FINAL DESIGN, CONSTRUCTION AND MAINTENANCE ARE THE RESPONSIBILITY OF RESPECTIVE UTILITY COMPANIES. COMPLIANCE WITH EASEMENTS AND REGULATIONS (STATE AND LOCAL) ARE THE RESPONSIBILITY OF RESPECTIVE UTILITY COMPANY.
5. DIGSAFE: IN ACCORDANCE WITH VERMONT STATE LAW (VSA TITLE 30 CHAPTER 86 AND PSB RULE 3.800) THE CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT DIGSAFE SYSTEMS, INC. "DIGSAFE", AT LEAST 48 HOURS , EXCLUDING SATURDAYS, SUNDAYS, AND LEGAL HOLIDAYS, BUT NOT MORE THAN 30 DAYS BEFORE COMMENCING EXCAVATION ACTIVITIES, EXCEPT IN AN EMERGENCY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PRE-MARKING THE SITE AND MAINTAINING DESIGNATED MARKINGS. FOR MORE INFORMATION ON DIGSAFE REQUIREMENTS SEE WWW.DIGSAFE.COM
6. JOBSITE SAFETY: NEITHER THE PROFESSIONAL ACTIVITIES OF TRUDELL CONSULTING ENGINEERS (TCE), NOR THE PRESENCE OF TCE OR ITS EMPLOYEES AND SUB CONSULTANTS AT A CONSTRUCTION SITE, SHALL RELIVE THE GENERAL CONTRACTOR AND ANY OTHER ENTITY OF THEIR OBLIGATIONS, DUTIES AND RESPONSIBILITIES INCLUDING, BUT NOT LIMITED TO, CONSTRUCTION MEANS, METHODS, SEQUENCE, TECHNIQUES OR PROCEDURES NECESSARY FOR PERFORMING, SUPERVISING OR COORDINATING ALL PORTIONS OF THE WORK OF CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ANY HEALTH OR SAFETY PRECAUTIONS REQUIRED BY ANY REGULATORY AGENCIES. TCE AND ITS PERSONNEL HAVE NO AUTHORITY TO EXERCISE ANY CONTROL OVER ANY CONSTRUCTION CONTRACTOR OR OTHER ENTITY OR THEIR EMPLOYEES IN CONNECTION WITH THEIR WORK OR ANY HEALTH OR SAFETY PRECAUTIONS. THE CLIENT AGREES THAT THE GENERAL CONTRACTOR IS SOLELY RESPONSIBLE FOR JOBSITE SAFETY, AND WARRANTS THAT THIS INTENT SHALL BE MADE EVIDENT IN THE CLIENT'S AGREEMENT WITH THE GENERAL CONTRACTOR. THE CLIENT ALSO AGREES THAT THE CLIENT, TCE AND TCE'S CONSULTANTS SHALL BE INDEMNIFIED AND SHALL BE MADE ADDITIONAL INSURED UNDER THE GENERAL CONTRACTOR'S GENERAL LIABILITY INSURANCE POLICY.
7. CODES AND STANDARDS COMPLIANCE:TCE SHALL EXERCISE USUAL AND CUSTOMARY PROFESSIONAL CARE IN ITS EFFORTS TO COMPLY WITH CODES, STANDARDS, REGULATIONS, AND ORDINANCES IN EFFECT. THE OWNER ACKNOWLEDGES THAT SUCH REQUIREMENTS MAY BE SUBJECT TO VARIOUS AND CONTRADICTORY INTERPRETATIONS. TCE, THEREFORE, WILL ITS REASONABLE PROFESSIONAL EFFORTS AND JUDGMENT TO INTERPRET APPLICABLE REQUIREMENTS AS THEY APPLY TO THE PROJECT. TCE, HOWEVER, CANNOT AND DOES NOT WARRANT OR GUARANTEE THAT THE PROJECT WILL COMPLY WITH ALL INTERPRETATIONS OF SUCH REQUIREMENTS.
8. CONSTRUCTION OBSERVATION: TCE MAY VISIT THE PROJECT AT APPROPRIATE INTERVALS DURING CONSTRUCTION TO BECOME GENERALLY FAMILIAR WITH THE PROGRESS AND QUALITY OF THE CONTRACTOR'S WORK AND TO DETERMINE IF THE WORK IS PRECEDING IN GENERAL ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE OWNER HAS NOT RETAINED TCE TO MAKE DETAILED INSPECTIONS OR TO PROVIDE EXHAUSTIVE OR CONTINUOUS PROJECT REVIEW AND OBSERVATION SERVICES. TCE DOES NOT GUARANTEE THE PERFORMANCE OF, AND SHALL NOT HAVE RESPONSIBILITY FOR, THE ACTS OR OMISSIONS OF ANY CONTRACTOR, SUB-CONTRACTOR, SUPPLIER OR ANY OTHER ENTITY FURNISHING MATERIALS OR PERFORMING ANY WORK ON THE PROJECT. TCE SHALL NOT SUPERVISE, DIRECT OR HAVE CONTROL OVER THE CONTRACTOR'S WORK NOR HAVE ANY RESPONSIBILITY FOR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OF THE CONTRACTOR. IF THE OWNER DESIRES MORE EXTENSIVE PROJECT OBSERVATION OR FULL-TIME PROJECT REPRESENTATION, THE OWNER SHALL REQUEST SUCH SERVICES BE PROVIDED BY TCE AS ADDITIONAL SERVICES.
9. UTILITIES SHOWN ARE APPROXIMATE AND DO NOT NECESSARILY REPRESENT ALL UTILITIES LOCATED ON OR ADJACENT TO THE AREA SURVEYED. THE CONTRACTOR SHALL FIELD VERIFY ALL UTILITY CONFLICTS. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER.
10. ALL EXISTING UTILITIES NOT INCORPORATED INTO THE FINAL DESIGN ARE TO BE REMOVED OR ABANDONED AS INDICATED ON THE PLANS.
11. THE CONTRACTOR SHALL MAINTAIN AS-BUILT PLANS (WITH TIES) FOR ALL UNDERGROUND UTILITIES. THOSE PLANS SHALL BE SUBMITTED TO THE OWNER AT THE COMPLETION OF THE PROJECT.
12. THE CONTRACTOR SHALL REPAIR/RESTORE ALL DISTURBED AREAS (ON OR OFF THE SITE) AS A DIRECT OR INDIRECT RESULT OF THE CONSTRUCTION.
13. ALL GRASSED AREAS SHALL BE MAINTAINED UNTIL FULL VEGETATION IS ESTABLISHED.
14. MAINTAIN ALL TREES OUTSIDE OF CONSTRUCTION LIMITS.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK NECESSARY FOR COMPLETE AND OPERABLE FACILITIES AND UTILITIES.
16. IN ADDITION TO THE REQUIREMENTS SET IN THESE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL COMPLETE THE WORK IN ACCORDANCE WITH ALL PERMIT CONDITIONS, LOCAL PUBLIC WORKS STANDARDS AND ALL CONSTRUCTION SAFETY REGULATIONS.
17. ANY DEWATERING NECESSARY FOR THE COMPLETION OF THE SITEWORK SHALL BE CONSIDERED AS PART OF THE CONTRACT AND SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
18. IF THERE ARE ANY CONFLICTS OR INCONSISTENCIES WITH THE PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR VERIFICATION BEFORE WORK CONTINUES ON THE ITEM(S) IN QUESTION.
19. ALL SYSTEM COMPONENTS (TANKS, PIPES, JOINTS) SHALL BE WATERTIGHT.

GENERAL NOTES:

1. CONTRACTOR TO ADJUST ANY POTABLE WATER LINE CROSSINGS AND CONSULT WITH ENGINEER TO MEET REQUIREMENTS SHOWN ON THE DETAIL SHEET "WATER/SEWER CROSSING" DETAIL.
2. SEWER LATERAL CONNECTIONS ARE SHOWN FOR CLARITY. CONTRACTOR TO CONSULT WITH ENGINEER AND SUPPLY BENDS, CLEANOUTS, ETC. AS NECESSARY TO FACILITATE PROPER CONNECTION BETWEEN FOUNDATION WALL AND SEWER MAIN LINE.
3. CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH ALL RELEVANT PARTIES (INCLUDING, BUT NOT LIMITED TO OWNER, ARCHITECT AND UTILITY COMPANIES) TO DETERMINE FINAL LAYOUT AND DESIGN.
4. DESIGN AND CONSTRUCTION OF PEDESTRIAN WALKS, RAMPS AND DECKS BETWEEN BUILDINGS AND PARKING LOTS IS PROVIDED BY THE ARCHITECT AND INCORPORATED INTO THE BUILDING DESIGN.
5. ALL CURB STOP VALVES TO BE INSTALLED WITH ACCESS COVER AT FINISHED GRADE.
6. ALL WATER LINE TAPS SHALL BE LIVE TAPS; EXISTING WATER LINE MUST REMAIN IN SERVICE DURING CONNECTION, UNLESS INDICATED OTHERWISE.

SURVEY NOTES:

1. THE PURPOSE OF THIS PLAN IS TO DEPICT PERTINENT EXISTING CONDITIONS AS OF THE DATE OF SURVEY. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON A FIELD SURVEY USING A TOPCON TOTAL STATION, PERFORMED BY TRUDELL CONSULTING ENGINEERS ON APRIL 26, 2011.
2. BEARINGS SHOWN ARE MAGNETIC NORTH TAKEN ALONG A LEG OF THE SURVEY TRAVERSE.
3. VERTICAL DATUM IS ASSUMED BASED ON TCE CONTROL POINT #1 ELEV.=500.0.
4. THE LOCATION OF EXISTING UNDERGROUND UTILITIES AND IMPROVEMENTS SHOWN ARE ASSUMED BASED ON RESEARCH, UTILITY PLANS PROVIDED BY OTHERS, AND/OR SURFACE EVIDENCE AVAILABLE AND WERE OBTAINED IN A MANNER CONSISTENT WITH THE ORDINARY STANDARD OF PROFESSIONAL CARE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR THE DESIGN ENGINEER. ENGINEER SHALL BE NOTIFIED IF ANY DISCREPANCIES ARE ENCOUNTERED. ACTUAL LOCATION OF UNDERGROUND UTILITIES MAY VARY. DIGSAFE MUST BE CONTACTED PRIOR TO AY EXCAVATION.

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802 879 6331 | WWW.TCEVT.COM

Revisions

No.	Description	Date	By

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For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

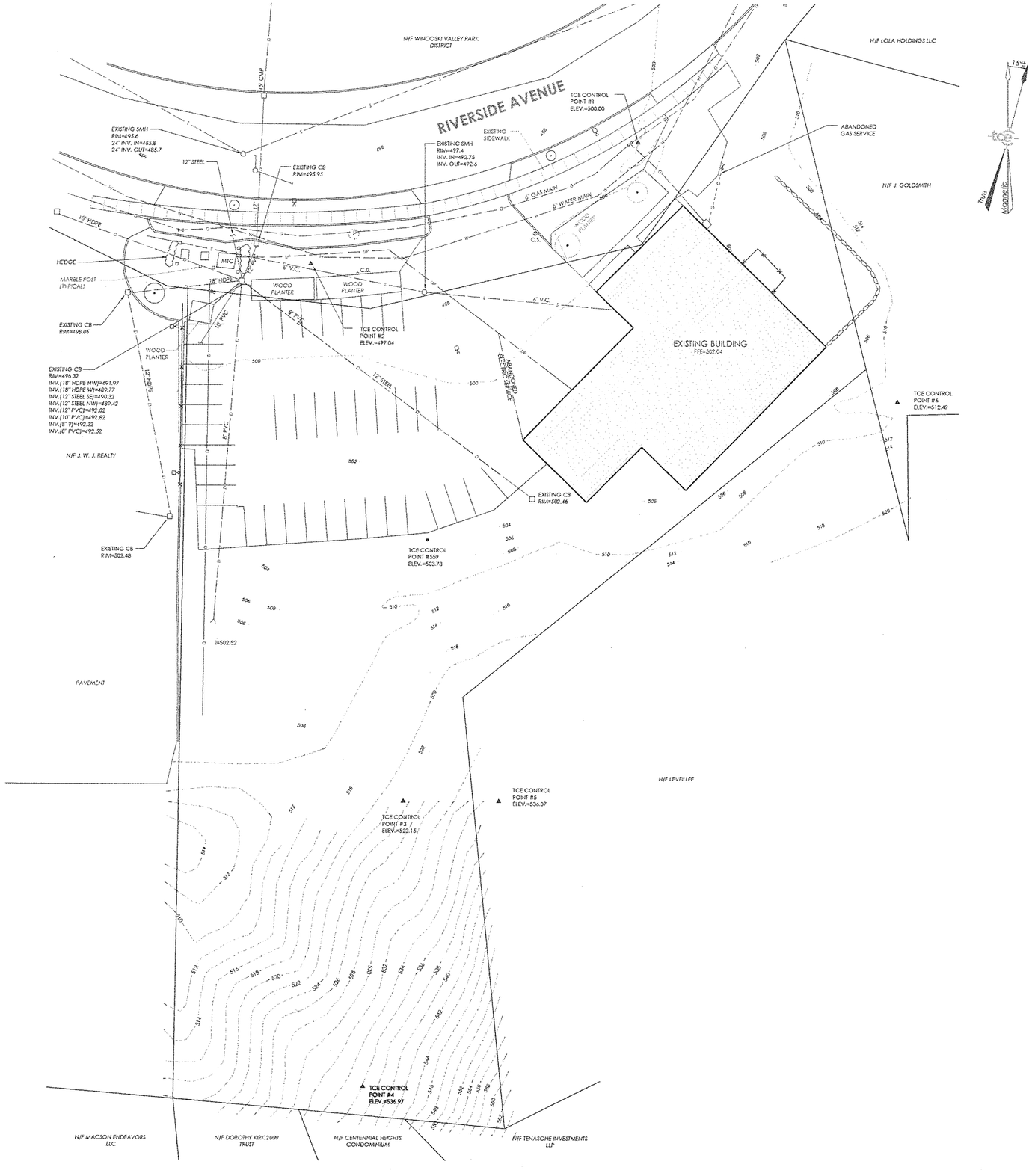
Legend & Notes

Date:	11/21/2012
Scale:	
Project Number:	2010083
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C1-01

Field Book:

Project Reference:



GENERAL NOTES:

1. OWNER OF RECORD: SISTERS AND BROTHERS INVESTMENT GROUP
2. TAX PARCEL ID: 046-3-081
3. PHYSICAL ADDRESS OF PROPERTY: 110 RIVERSIDE AVE. BURLINGTON, VERMONT 05401
4. PARCEL SIZE: 1.22 ACRES±
5. LOT COVERAGE: BUILDINGS - 6,887 SQ. FT. OR 13.0% OVERALL - 21,409 SQ. FT. OR 40.4%
6. PARKING: 36 SPACES

SURVEY NOTES:

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Graphic Scale

20 0 20 40 60 80 Feet

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802.879.9331 | WWW.TCEVT.COM

Revisions

No.	Description	Date	By

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For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

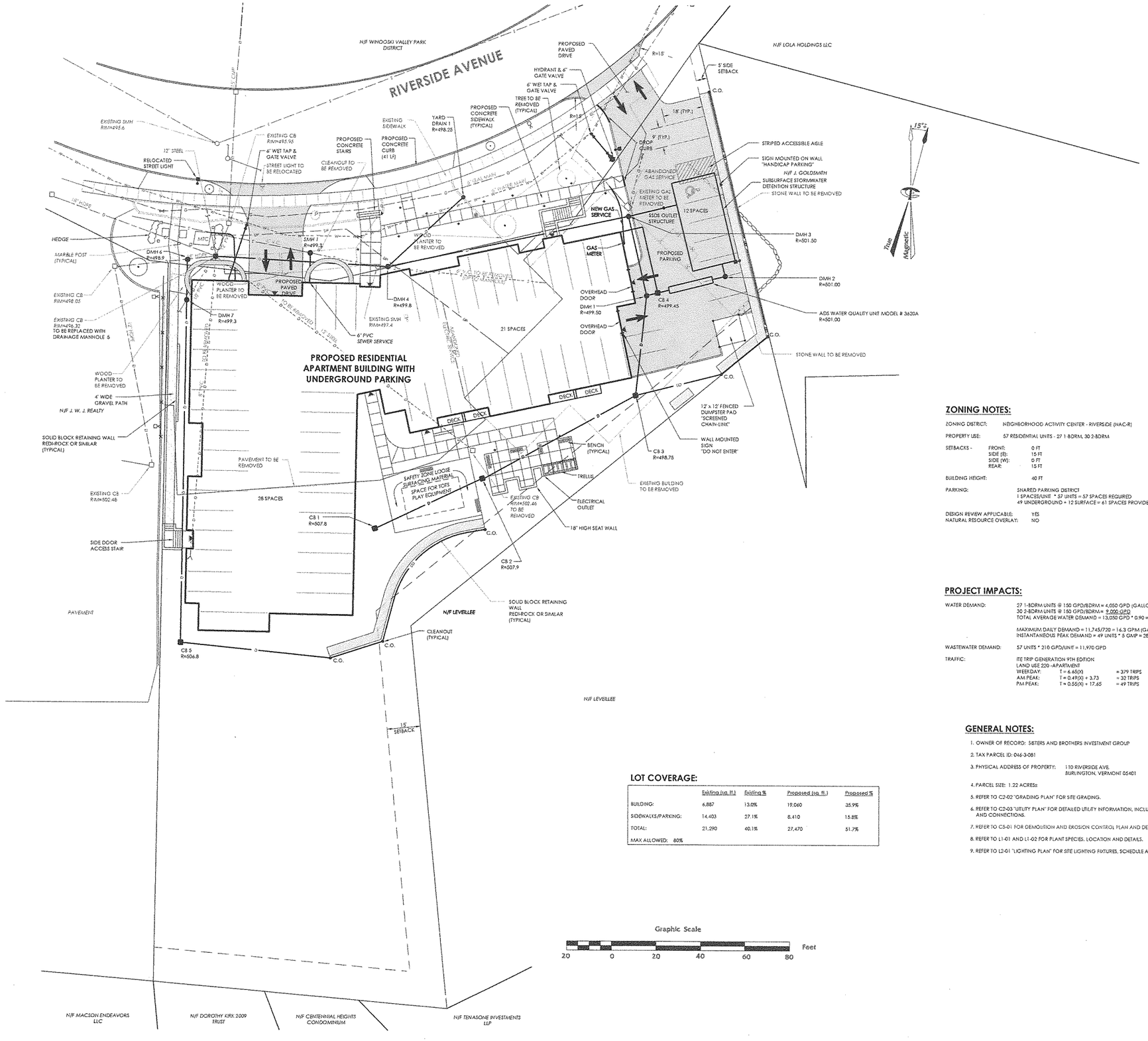
Existing Conditions

Date:	11/21/12
Scale:	1" = 20'
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

C1-03

Field Book:

Project Reference:



ZONING NOTES:

ZONING DISTRICT:	NEIGHBORHOOD ACTIVITY CENTER - RIVERSIDE (NAC-R)	
PROPERTY USE:	57 RESIDENTIAL UNITS - 27 1-BDRM, 30 2-BDRM	
SETBACKS -	FRONT:	0 FT
	SIDE (E):	15 FT
	SIDE (W):	0 FT
	REAR:	15 FT
BUILDING HEIGHT:	40 FT	
PARKING:	SHARED PARKING DISTRICT 1 SPACES/UNIT * 57 UNITS = 57 SPACES REQUIRED 49 UNDERGROUND + 12 SURFACE= 61 SPACES PROVIDED.	
DESIGN REVIEW APPLICABLE:	YES	
NATURAL RESOURCE OVERLAY:	NO	

PROJECT IMPACTS:

WATER DEMAND:	27 1-BDRM UNITS @ 150 GPD/BDRM = 4,050 GPD (GALLONS PER DAY) 30 2-BDRM UNITS @ 150 GPD/BDRM= 9,000 GPD TOTAL AVERAGE WATER DEMAND = 13,050 GPD * 0.90 = 11,745 GPD	
	MAXIMUM DAILY DEMAND = 11,745/720 = 16.3 GPM (GALLONS PER MINUTE) INSTANTANEOUS PEAK DEMAND = 49 UNITS * 5 GMP = 265 GPM	
WASTEWATER DEMAND:	57 UNITS * 210 GPD/UNIT = 11,970 GPD	
TRAFFIC:	ITE TRIP GENERATION 9TH EDITION LAND USE 220 -APARTMENT	
	WEEKDAY:	T = 6.65(X) = 379 TRIPS
	AM PEAK:	T = 0.49(X) + 3.73 = 32 TRIPS
	PM PEAK:	T = 0.55(X) + 17.65 = 49 TRIPS

GENERAL NOTES:

1. OWNER OF RECORD: SISTERS AND BROTHERS INVESTMENT GROUP
2. TAX PARCEL ID: 046-3-081
3. PHYSICAL ADDRESS OF PROPERTY: 110 RIVERSIDE AVE. BURLINGTON, VERMONT 05401
4. PARCEL SIZE: 1.22 ACRES±
5. REFER TO C2-02 "GRADING PLAN" FOR SITE GRADING.
6. REFER TO C2-03 "UTILITY PLAN" FOR DETAILED UTILITY INFORMATION, INCLUDING RIMS, INVERTS, CROSSINGS, AND CONNECTIONS.
7. REFER TO C5-01 FOR DEMOLITION AND EROSION CONTROL PLAN AND DETAILS.
8. REFER TO L1-01 AND L1-02 FOR PLANT SPECIES, LOCATION AND DETAILS.
9. REFER TO L2-01 "LIGHTING PLAN" FOR SITE LIGHTING FIXTURES, SCHEDULE AND DETAILS.

LOT COVERAGE:

	Existing (sq. ft.)	Existing %	Proposed (sq. ft.)	Proposed %
BUILDING:	6,887	13.0%	19,060	35.9%
SIDEWALKS/PARKING:	14,403	27.1%	8,410	15.8%
TOTAL:	21,290	40.1%	27,470	51.7%
MAX ALLOWED: 80%				

Graphic Scale

20 0 20 40 60 80 Feet

tce

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802 879 6331 |
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Revisions

No.	Description	Date	By

Use of These Drawings
1. Unless otherwise noted, these Drawings are intended for preliminary planning, coordination with other disciplines or utilities, and/or approval from the regulatory authorities. They are not intended as construction drawings unless noted as such.

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5. It is the User's responsibility to ensure this copy contains the most current revisions.

For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

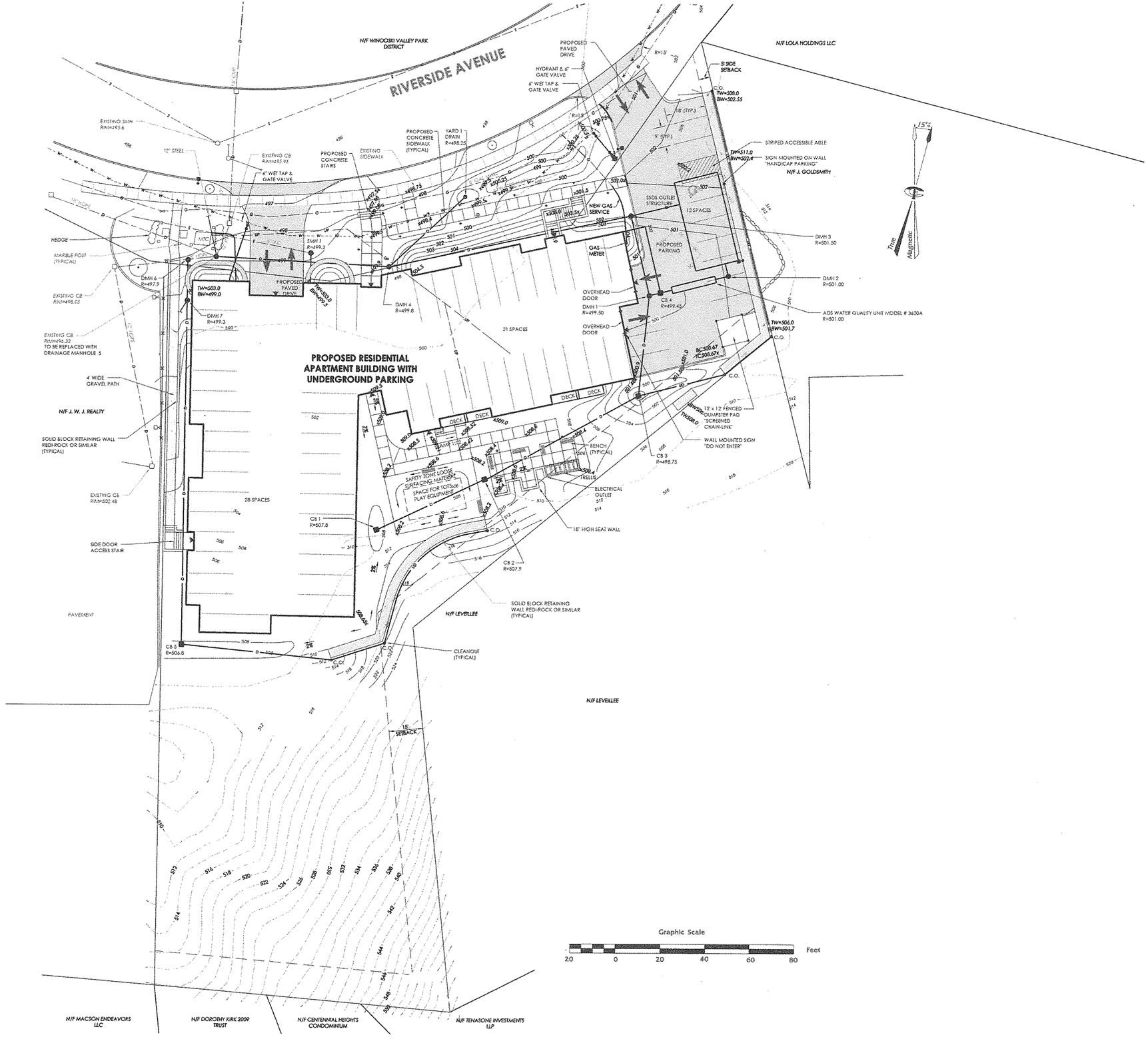
Site Plan

Date:	11/21/2012
Scale:	1" = 20'
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

C2-01

Field Book:

Project Reference:



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Revisions

No.	Description	Date	By
1	revision	1/1/12	xxx

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For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

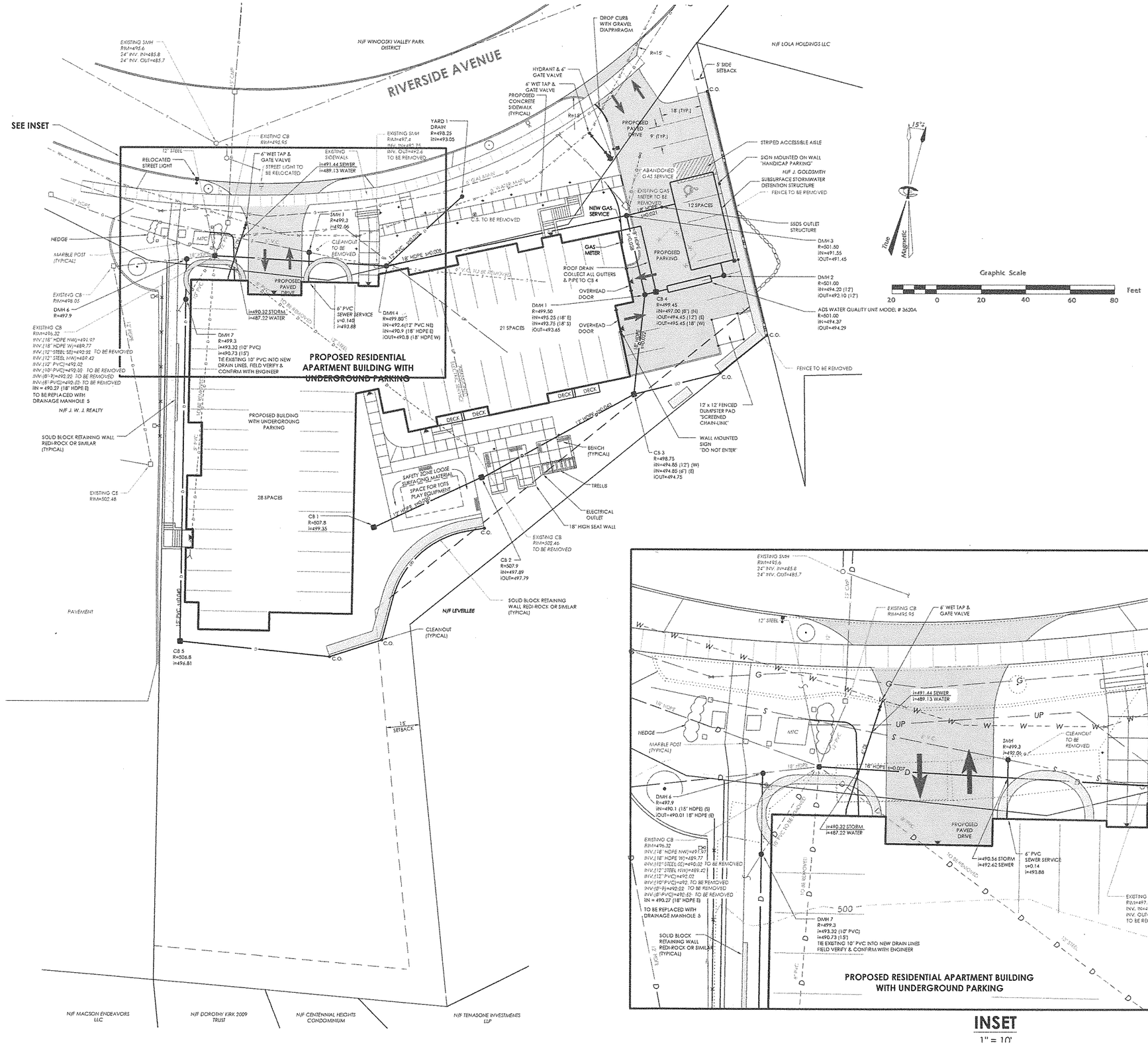
Grading Plan

Date:	11/21/2012
Scale:	1" = 20'
Project Number:	2010083
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C2-02

Field Book:

Project Reference:



INSET
1" = 10'

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For Permitting Only

Project Title

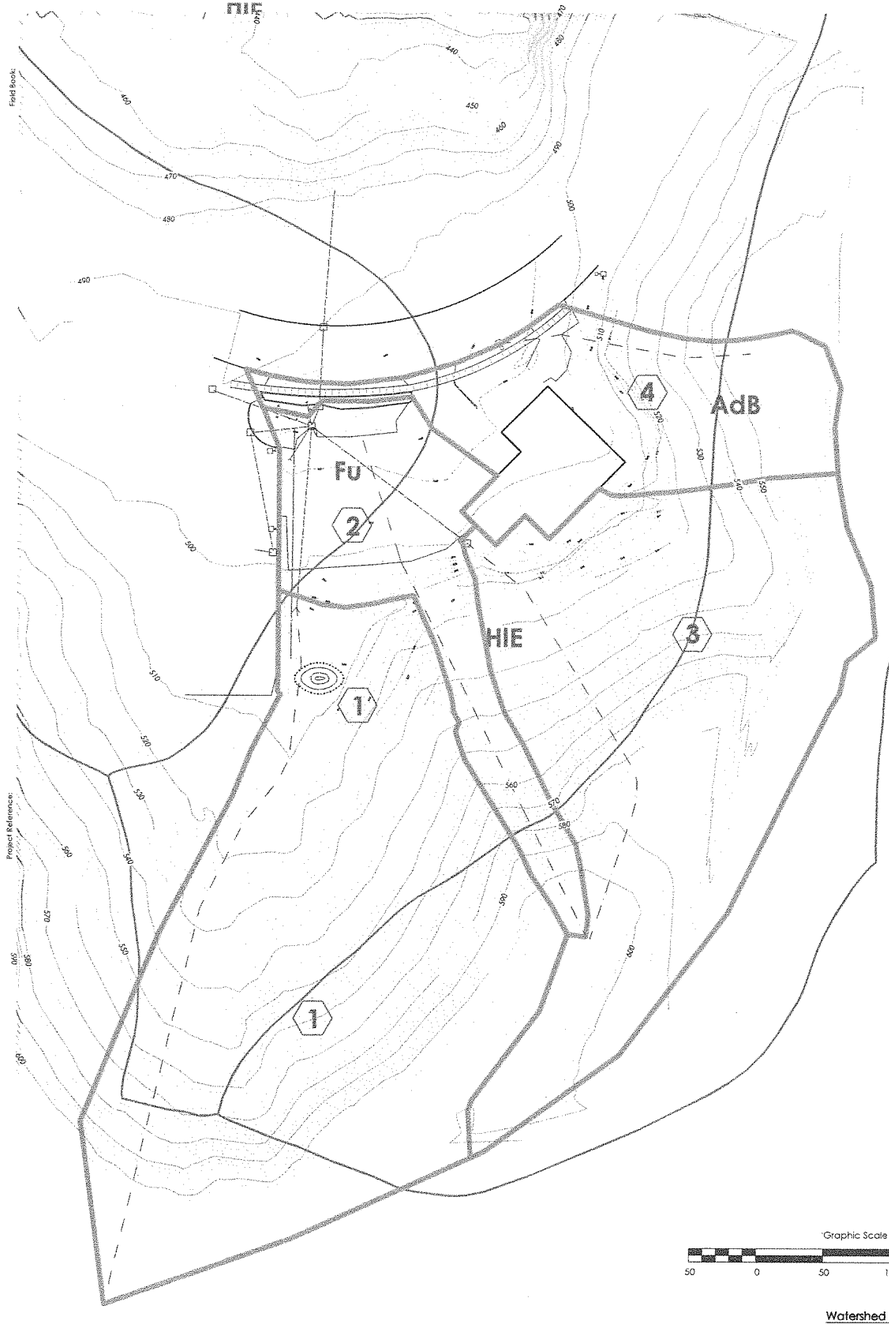
Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

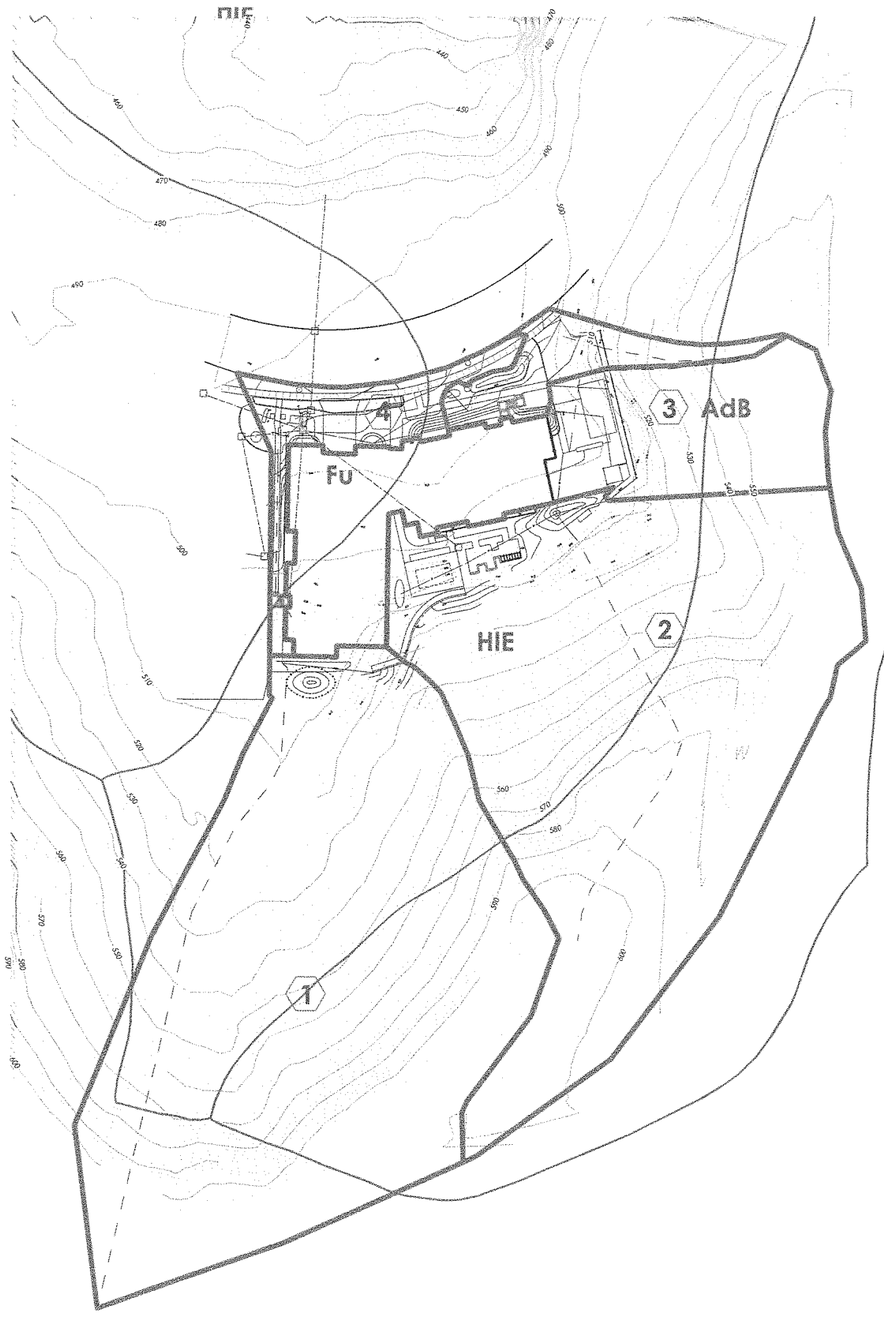
Sheet Title

Utility Plan

Date:	11/21/2012
Scale:	SHOWN
Project Number:	2010083
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C2-03





Graphic Scale

50 0 50 100 150 200 Feet

Watershed Legend:

1, 2, 3, 4	Site Pre-Development Watershed
1, 2, 3, 4	Site Post-Development Watershed
Cv	Soil type boundary line and Label
	Time of Concentration (Tc)

EXISTING CONDITION WATERSHEDS

POST DEVELOPMENT WATERSHEDS

Soils Legend:

Fu - Fill land
HIE - Hartland very fine sandy loam
AdA/AdB - Adams and Windsor loamy sands
RhE - Rhineburg Fine Sandy Loam

HYDROLIC SOIL GROUP

N/A
B
A
C

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No.	Description	Date	By

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Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

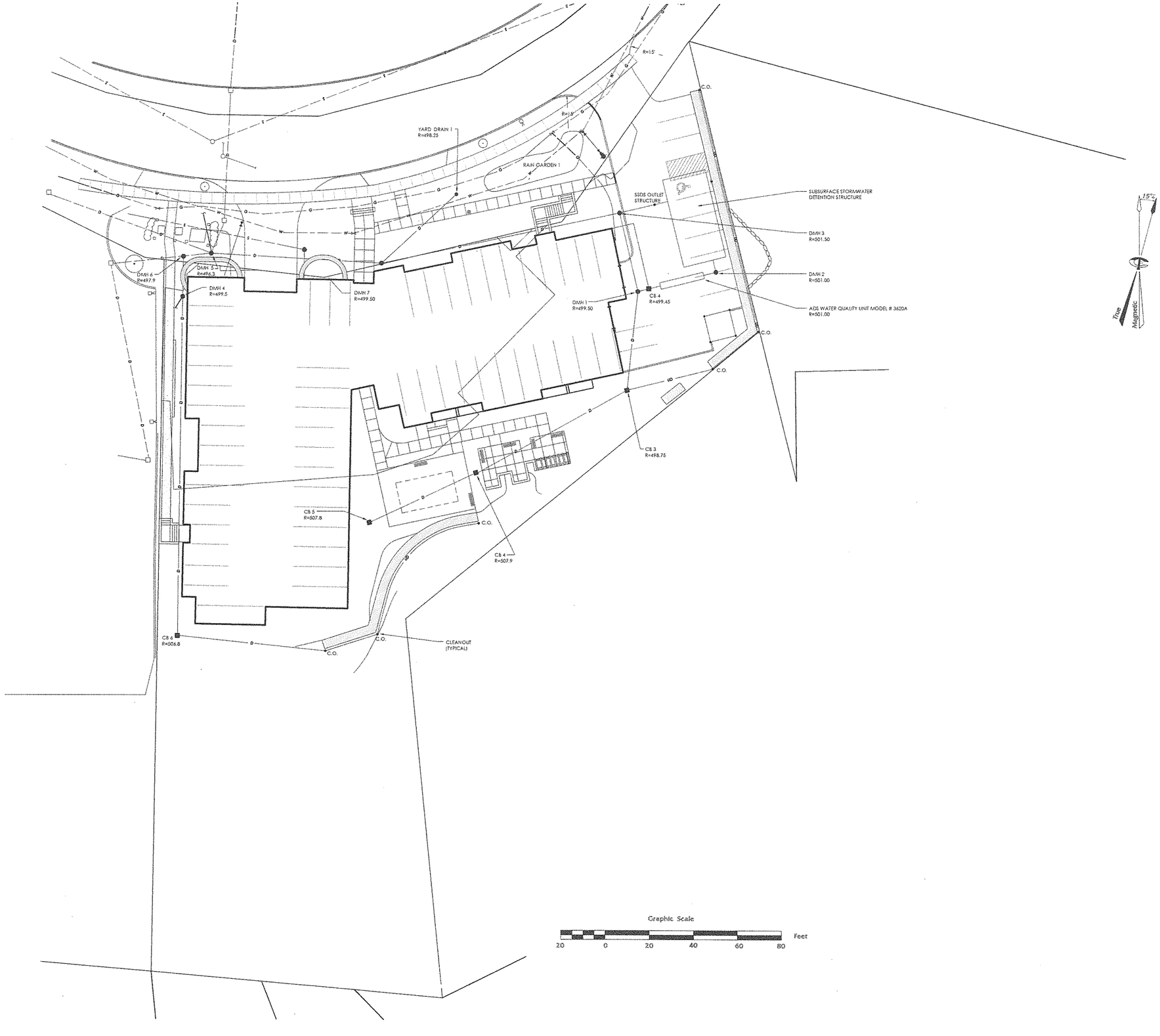
Watershed Delineation Plan

Date:	---
Scale:	
Project Number:	2010083
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C4-01

Field Book:

Project Reference:



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No.	Description	Date	By

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Project Title

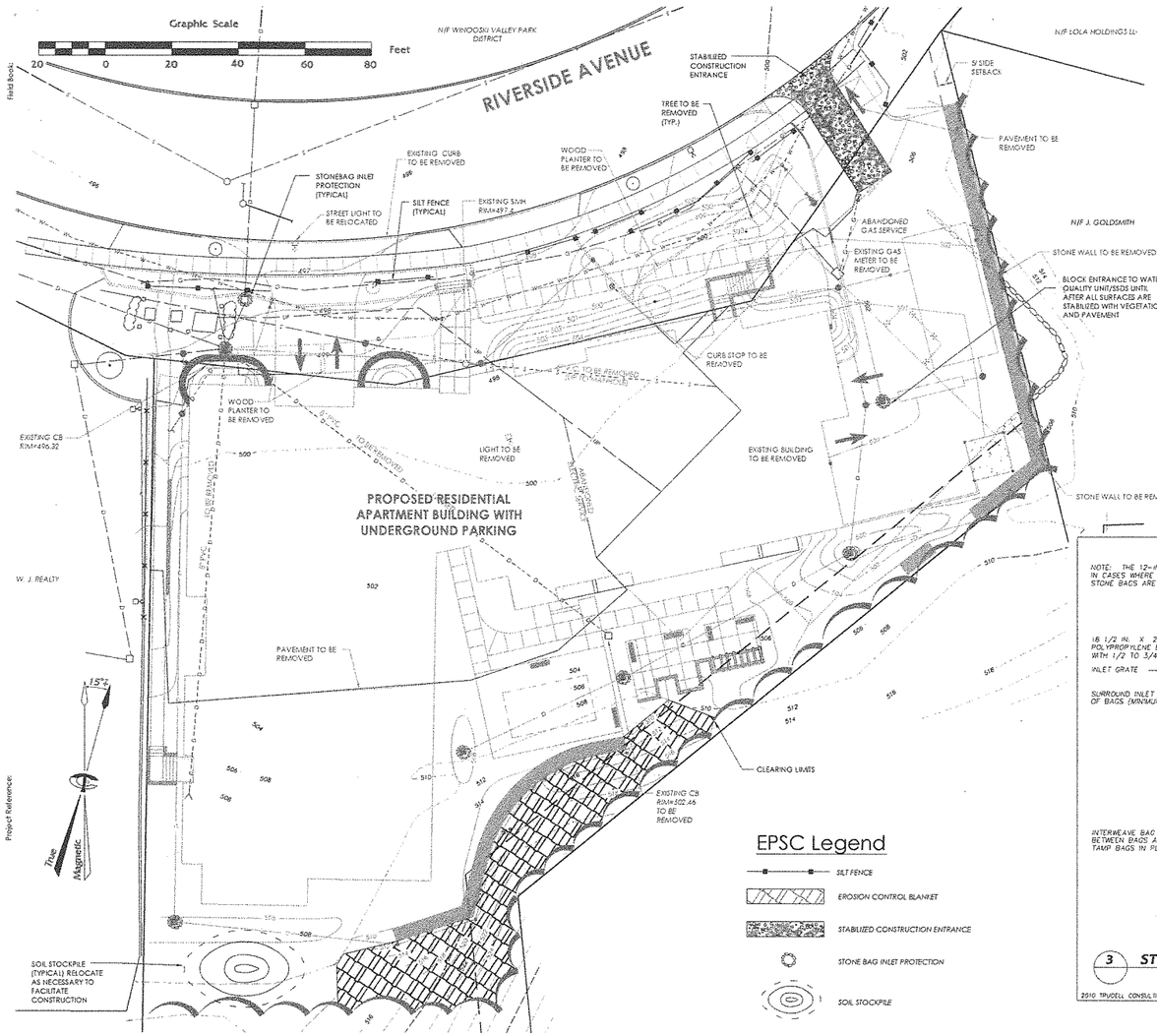
Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

Stormwater Operations & Maintenance Plan

Date:	---
Scale:	
Project Number:	2010083
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C4-02



EPSC Legend

- SILT FENCE
- EROSION CONTROL BLANKET
- STABILIZED CONSTRUCTION ENTRANCE
- STONE BAG INLET PROTECTION
- SOIL STOCKPILE

TEMPORARY EROSION CONTROL MEASURES:

1) THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME

2) CONSTRUCT TEMPORARY AND PERMANENT SEDIMENT AND EROSION CONTROL FACILITIES. EROSION AND SEDIMENT MEASURES SHALL BE INSTALLED PRIOR TO ANY EARTH MOVING OPERATIONS

3) SILT FENCE PLACEMENT SHALL BE INSTALLED AS NOTED ON PLANS. PERIODICALLY SILT FENCES SHALL BE MAINTAINED AND CLEANED UNTIL ALL DISTURBED AREAS HAVE A HEALTHY STAND OF GRASS

4) BEGIN PERMANENT AND TEMPORARY MULCHING AND SEEDING AS LISTED IN THE MAINTENANCE AND TIME OF PLACEMENT SCHEDULE

5) AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED THE TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED.

EROSION CONTROL UTILITY CONSTRUCTION NOTES:

1) THE CONTRACTOR SHALL DISTURB AND OPEN TRENCH THE MINIMUM PRACTICAL AREA REQUIRED TO ACCOMPLISH EACH DAY'S WORK.

2) EXCAVATED TRENCH MATERIAL SHALL BE PLACED ON UPSTREAM SIDE OF TRENCH

3) IMMEDIATELY FOLLOWING PIPE INSTALLATION, THE TRENCH SHALL BE BACKFILLED, COMPACTED, AND IMMEDIATELY STABILIZED (MULCHED AND SEEDED OR SODDED)

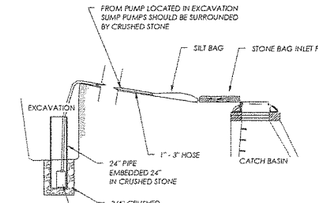
4) TEMPORARY SILT FENCES SHALL BE PLACED IMMEDIATELY DOWN STREAM (AND PARALLEL TO THE CONTOURS) OF ANY WORK AREA INTENDED TO BE DISTURBED FOR MORE THAN ONE WORKING DAY.

5) EXCAVATION AND PIPE INSTALLATION SHALL BE AVOIDED DURING PERIODS OF SIGNIFICANT PRECIPITATION.

6) ALL SEDIMENT AND EROSION CONTROL PRACTICES AND VEGETATIVE STABILIZATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS HEREON, AND THE VERMONT HANDBOOK FOR SOIL EROSION AND SEDIMENT CONTROL ON CONSTRUCTION SITES.

1 EROSION CONTROL NOTES

2005 TRUDELL CONSULTING ENGINEERS — LAST REVISED 02/23/05



1. ALL DEWATERING OF CONSTRUCTION TRENCH SHALL BE PUMPED THROUGH A SILT BAG (ACF INTERNATIONAL), OR APPROVED EQUAL, PUMPED-SILT CONTROL SYSTEM.

2. THE PUMPED-SILT CONTROL SYSTEM SHALL BE NON-WOVEN BAG, WHICH IS SEWN WITH DOUBLE NEEDLE MACHINE USING HIGH STRENGTH THREAD.

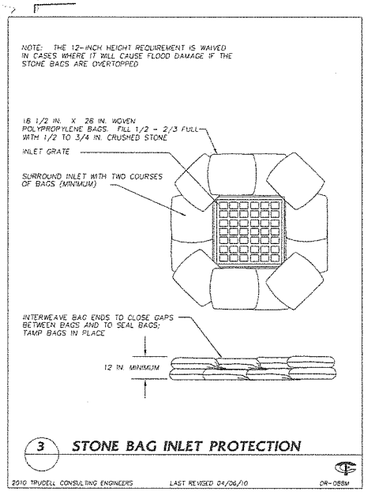
3. THE PUMPED-SILT CONTROL SYSTEM SHALL BE INSTALLED ON A SHALLOW SLOPE. IT SHOULD BE PLACED SO THE INCOMING WATER FLOWS INTO THE BAG AND WILL FLOW THROUGH THE PUMPED-SILT CONTROL SYSTEM AND THEN FLOW OFF THE SITE WITHOUT CREATING MORE EROSION. THE NECK OF THE PUMPED-SILT CONTROL SYSTEM SHOULD BE TIED OFF TIGHTLY, TO STOP THE WATER FROM FLOWING OUT OF THE PUMPED-SILT CONTROL SYSTEM, WITHOUT GOING THROUGH THE WALLS OF THE BAG. TO INCREASE THE SURFACE AREA BEING USED THE PUMPED-SILT CONTROL SYSTEM SHALL BE PLACED ON A GRAVEL BED TO MAXIMIZE DIRTBAG FLOW CAPACITY AND FILTERING.

4. THE PUMPED-SILT CONTROL SYSTEM IS CONSIDERED FULL AND SHOULD BE DISPOSED WHEN IT IS IMPRACTICAL FOR THE BAG TO FILTER THE SEDIMENT OUT AT A REASONABLE FLOW RATE AND SHALL BE REPLACED.

2 EXCAVATION DEWATERING DETAIL

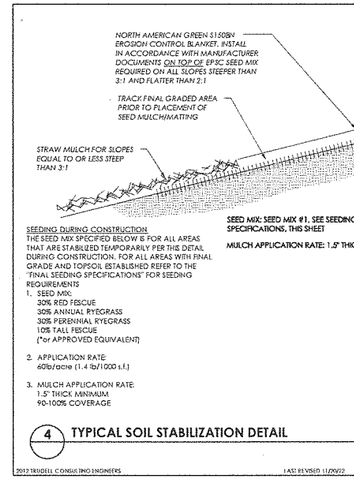
N.T.S.

2012 TRUDELL CONSULTING ENGINEERS — LAST REVISED 11/21/12



3 STONE BAG INLET PROTECTION

2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/06/10 — DR-08BM



SEEDING DURING CONSTRUCTION
THE SEED MIX SPECIFIED BELOW IS FOR ALL AREAS THAT ARE STABILIZED TEMPORARILY PER THIS DETAIL DURING CONSTRUCTION. FOR ALL AREAS WITH FINAL GRADE AND TOPSOIL ESTABLISHED REFER TO THE "FINAL SEEDING SPECIFICATIONS" FOR SEEDING REQUIREMENTS

1. SEED MIX:
   30% RED FESCUE
   30% ANNUAL RYEGRASS
   30% PERENNIAL RYEGRASS
   10% TALL FESCUE
   (*or APPROVED EQUIVALENT)
2. APPLICATION RATE:
   60lb/acre (1.4 lb/1000 s.f.)
3. MULCH APPLICATION RATE:
   1.5" THICK MINIMUM
   90-100% COVERAGE

SEED MIX: SEED MIX #1, SEE SEEDING SPECIFICATIONS, THIS SHEET

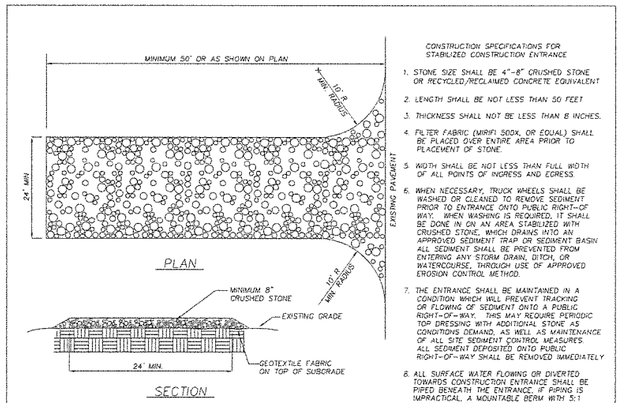
MULCH APPLICATION RATE: 1.5" THICK MIN.

NOTES:
1. SOIL SURFACE AND FILL COMPONENTS MUST NOT BE FROZEN WHEN PLACED.
2. SLOPES STEEPER THAN 2:1 MUST BE MECHANICALLY STABILIZED WITH A RETAINING STRUCTURE OR APPROPRIATE GEOTEXTILE (AS SPECIFIED BY ENGINEER).
3. STRAW MULCH or EROSION CONTROL BLANKET CAN BE USED ON AREAS WITH SLOPES EQUAL TO OR LESS STEEP THAN 3:1.
4. HAY MULCH SHALL CONSIST OF MOWED AND PROPERLY CURED STEMS OF CEREAL GRAINS (WHEAT, OATS, BUCKWHEAT, ETC.) REASONABLY FREE OF WEEDS, TWIGS, DEBRIS OR OTHER OBJECTIONABLE MATERIAL. IT SHALL BE FREE FROM ROT OR MOLD AND SHALL BE ACCEPTABLE TO THE ENGINEER.
5. BANKS, SWALES OR OTHER GRADED AREAS THAT HAVE BEEN WASHED OUT OR HAVE BECOME DAMAGED SHALL BE REPAIRED IMMEDIATELY.

4 TYPICAL SOIL STABILIZATION DETAIL

N.T.S.

2012 TRUDELL CONSULTING ENGINEERS — LAST REVISED 11/21/12 — ER-002



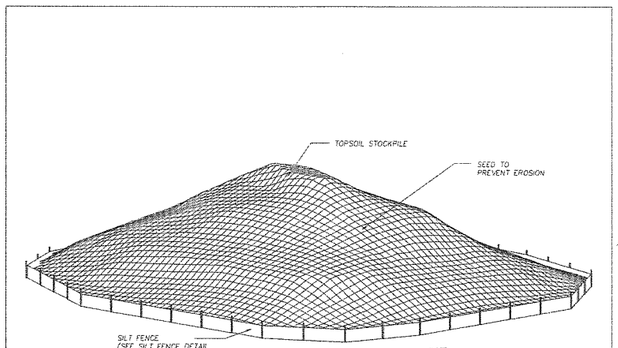
CONSTRUCTION SPECIFICATIONS FOR STABILIZED CONSTRUCTION ENTRANCE

1. STONE SIZE SHALL BE 4"-8" CRUSHED STONE OR RECYCLED/RECLAIMED CONCRETE EQUIVALENT
2. LENGTH SHALL BE NOT LESS THAN 50 FEET
3. THICKNESS SHALL NOT BE LESS THAN 8 INCHES.
4. FILTER FABRIC (MIRAFI 500X, OR EQUAL) SHALL BE PLACED OVER ENTIRE AREA PRIOR TO PLACEMENT OF STONE.
5. WIDTH SHALL BE NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS AND EGRESS.
6. WHEN NECESSARY, TRUCK WHEELS SHALL BE WASHED OR CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE IN ON AN AREA STABILIZED WITH CRUSHED STONE, WHICH DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH, OR WATERCOURSE, THROUGH USE OF APPROVED EROSION CONTROL METHOD.
7. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO A PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AS WELL AS MAINTENANCE OF ALL SITE SEDIMENT CONTROL MEASURES. ALL SEDIMENT DEPOSITED ONTO PUBLIC RIGHT-OF-WAY SHALL BE REMOVED IMMEDIATELY
8. ALL SURFACE WATER FLOWING OR DIVERTED TOWARDS CONSTRUCTION ENTRANCE SHALL BE PIPED BENEATH THE ENTRANCE, IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.

5 STABILIZED CONSTRUCTION ENTRANCE

1" = 10'

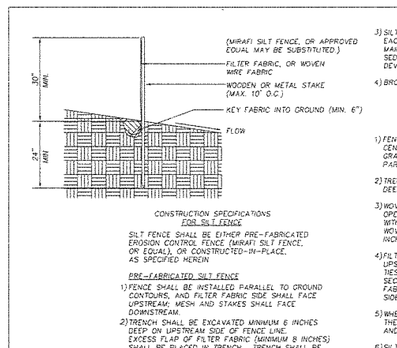
TRUDELL CONSULTING ENGINEERS (TCE)



NOTE:
INSTALL SILT FENCE ALONG CONTOUR ON DOWNSLOPE SIDES AT A DISTANCE OF 5-10 FEET FROM THE TOE OF THE STOCKPILE. COMPLETELY ENCLOSE STOCKPILE ON FLAT SITES. SILT FENCE TO REMAIN IN PLACE UNTIL MATERIAL IS REMOVED AND AREA IS STABILIZED.

6 TEMPORARY TOPSOIL STOCKPILE EROSION PROTECTION

2010 TRUDELL CONSULTING ENGINEERS, INC. — LAST REVISED 04/06/10 — DR-08DM



CONSTRUCTION SPECIFICATIONS
FOR SILT FENCE

SILT FENCE SHALL BE EITHER PRE-FABRICATED EROSION CONTROL FENCE (MIRAFI SILT FENCE, OR EQUAL), OR CONSTRUCTED-IN-PLACE, AS SPECIFIED HEREIN

PRE-FABRICATED SILT FENCE

1) FENCE SHALL BE INSTALLED PARALLEL TO GROUND CONTOURS, AND FILTER FABRIC SIDE SHALL FACE UPSTREAM; MESH AND STAKES SHALL FACE DOWNSTREAM.
2) TRENCH SHALL BE EXCAVATED MINIMUM 6 INCHES DEEP ON UPSTREAM SIDE OF FENCE LINE. EXCESS FLAP OF FILTER FABRIC (MINIMUM 8 INCHES) SHALL BE PLACED IN TRENCH. TRENCH SHALL BE BACKFILLED AND COMPACTED. CONSTRUCTION IN THIS MANNER PREVENTS SEDIMENT-LADEN RUNOFF FROM FLOWING UNDER SILT FENCE.
3) SILT FENCE SHALL BE INSPECTED WEEKLY, AND AFTER EACH SIGNIFICANT PRECIPITATION EVENT. MAINTENANCE SHALL BE PERFORMED AS NEEDED, AND SEDIMENT SHALL BE REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE
4) BROKEN STAKES SHALL BE REPLACED PROMPTLY

CONSTRUCTED-IN-PLACE SILT FENCE

1) FENCE POST SHALL BE DRIVEN, 10 FEET MAXIMUM ON CENTER; POSTS SHALL BE DRIVEN MINIMUM 24" BELOW GRADE. FENCE SHALL BE POSITIONED AS SHOWN, PARALLEL TO THE GROUND CONTOURS.
2) TRENCH SHALL BE EXCAVATED MINIMUM 6 INCHES DEEP ON UPSTREAM SIDE OF FENCE LINE.
3) WOVEN WIRE FABRIC (14 GA., 6 INCH MAX. MESH OPENING) SHALL BE STAPLED OR FASTENED SECURELY WITH WIRE TIES TO UPSTREAM SIDE OF FENCE POSTS. WOVEN WIRE FABRIC SHALL EXTEND MINIMUM 36 INCHES ABOVE GRADE.
4) FILTER FABRIC SHALL BE FASTENED SECURELY ON UPSTREAM SIDE OF WOVEN WIRE FABRIC WITH WIRE TIES, SPACED EVERY 24 INCHES, AT TOP AND MID-SECTION OF FENCE. MINIMUM 8 INCH FLAP OF FILTER FABRIC SHALL BE PLACED IN TRENCH ON UPSTREAM SIDE OF FENCE, AND BACKFILLED.
5) WHEN TWO SECTIONS OF FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6 INCHES, FOLDED AND STAPLED.
6) SILT FENCE SHALL BE INSPECTED WEEKLY, AND AFTER EACH SIGNIFICANT PRECIPITATION EVENT. MAINTENANCE SHALL BE PERFORMED AS NEEDED, AND SEDIMENT REMOVED WHEN "BULGES" DEVELOP IN SILT FENCE, OR WHEN SEDIMENT REACHES 1/3 THE HEIGHT OF THE FENCE.

7 SILT FENCE

2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/06/10 — ER-026M

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802 879 6331 |
WWW.TCEVT.COM

Revisions

No.	Description	Date

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5. It is the User's responsibility to ensure this copy contains the most current revisions.

For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

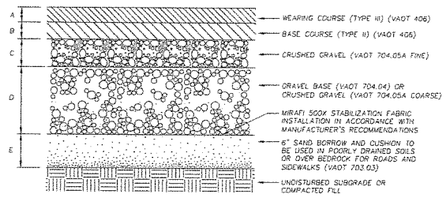
Sheet Title

Demolition & Erosion Control Plan

Date:	11/21/2012
Scale:	1" = 20'
Project Number:	2010068
Drawn By:	RMP
Project Engineer:	AAL
Approved By:	

C5-01

Hard Boots



SECTION

THICKNESS (INCHES)					
	ROADS		PARKING LOTS		PRIVATE
	RESIDENTIAL	COMMERCIAL	RESIDENTIAL	COMMERCIAL	DRIVEWAYS
A	1.5	1.5	1	1.5	2
B	2.5	2.5	2	2.5	N/A
C	6	5	6	6	4
D	12	18	12	18	12
E	6	6	6	6	6

NOTES:
1. SUBBASE, SAND CUSHION AND SUBGRADE SHOULD BE CONSTRUCTED AND COMPACTED TO THE DIMENSIONS SHOWN IN ACCORDANCE WITH VERMONT AGENCY OF TRANSPORTATION SPECIFICATIONS, STANDARD A-76. WHERE MORE STRINGENT LOCAL ORDINANCES HAVE BEEN ADOPTED RELATIVE TO ROAD DIMENSIONS AND CONSTRUCTION, THEY SHOULD GOVERN.

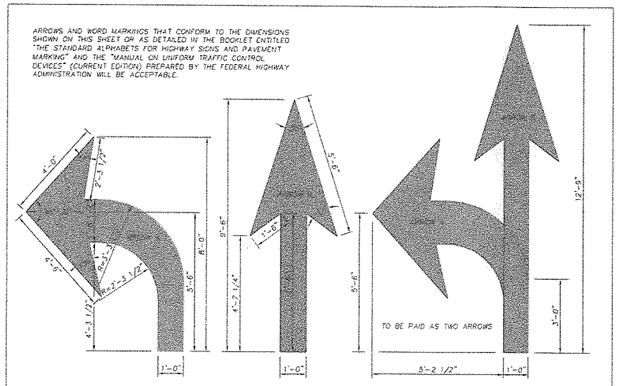
2. COMPACT ALL SUBBASE MATERIALS TO 95% MAXIMUM DENSITY (STANDARD PROCTOR).

3. IF GROUNDWATER OR SOFT SPOTS ARE ENCOUNTERED CONTACT THE ENGINEER TO DISCUSS ADDED MEASURES SUCH AS UNDERDRAIN. SLOPE SUBBASE TO UNDERDRAIN LOW POINTS.

1 BITUMINOUS PAVEMENT

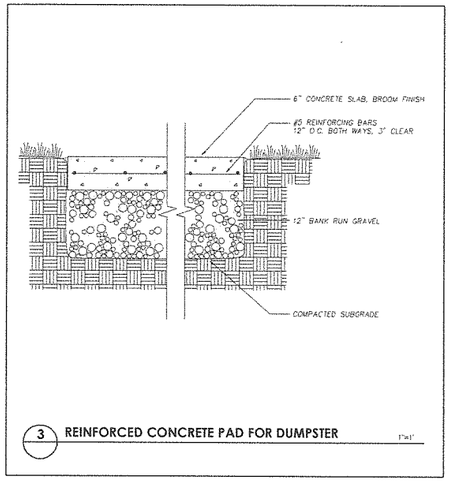
2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/08/2011 — L-RS03M

ARROWS AND WORD MARKINGS THAT CONFORM TO THE DIMENSIONS SHOWN ON THIS SHEET OR AS DETAILED IN THE BOOKLET ENTITLED "THE STANDARD ALPHABETS FOR HIGHWAY SIGNS AND PAVEMENT MARKING" AND THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (CURRENT EDITION) PREPARED BY THE FEDERAL HIGHWAY ADMINISTRATION WILL BE ACCEPTABLE.

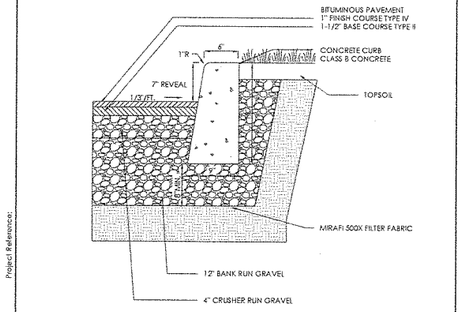


2 PAVEMENT MARKING FOR DIRECTIONAL ARROWS

2011 TRUDELL CONSULTING ENGINEERS — LAST REVISED 03/08/2011 — L-SG03M



3 REINFORCED CONCRETE PAD FOR DUMPSTER 1"=1'



4 PAVEMENT AND CURB DETAIL 1"=1'

2012 TRUDELL CONSULTING ENGINEERS — LAST REVISED 07/09/2012 — L-SD45

SPECIFICATIONS:

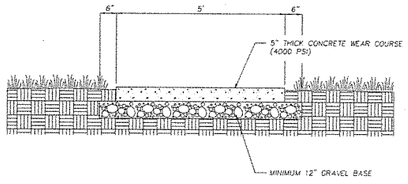
1/2" EXPANSION/CONTRACTION JOINT WITH ASPHALT IMPREGNATED FIBER BOARD FILLER EVERY 50 FEET.

SCORED OR TOOLED JOINT (1" DEPTH OR 1/3 THE TOTAL DEPTH OF WALK) WITH A SEPARATION DISTANCE EQUAL TO THE WIDTH OF THE SIDEWALK.

FULL-BREAK OR COMPLETE JOINT EVERY 20 FEET

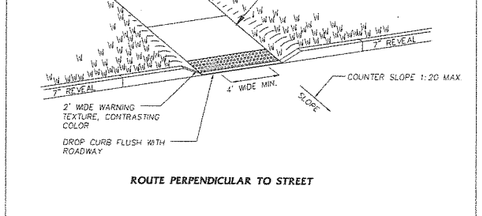
INCREASE CONCRETE THICKNESS TO 8" WHEN SIDEWALK CROSSES A DRIVEWAY.

NOTE: DISTANCES ARE TYPICAL AND MAY BE ALTERED FOR SPECIFIC SITE CONDITIONS.



5 TYPICAL CONCRETE SIDEWALK 1/2" = 1'-0"

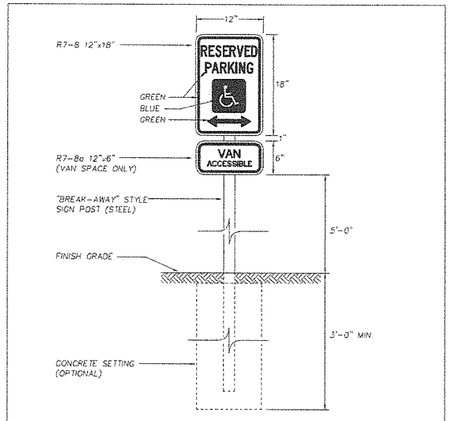
2011 TRUDELL CONSULTING ENGINEERS — LAST REVISED 01-14-2011 — L-SW03S



ROUTE PERPENDICULAR TO STREET

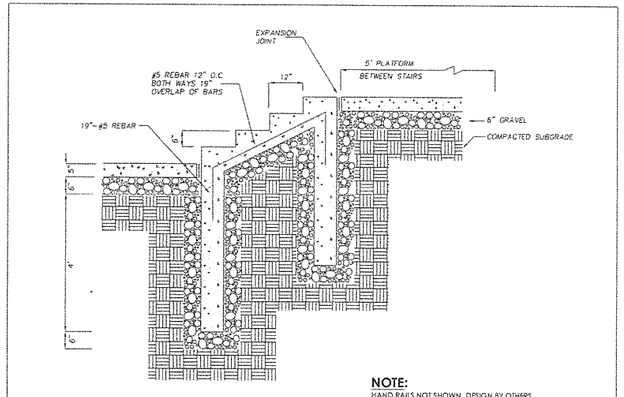
6 HANDICAP CURB RAMP - PUBLIC R-O-W

2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/07/10 — L-HC-08L



7 "RESERVED PARKING" SIGN 1"=1'-0"

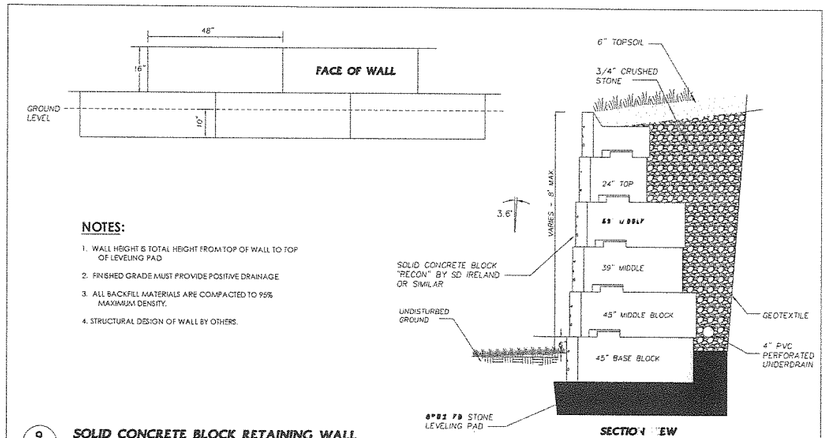
2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/07/10 — L-SC00S



NOTE:
HAND RAILS NOT SHOWN, DESIGN BY OTHERS.

8 CONCRETE EXTERIOR STAIR

2012 TRUDELL CONSULTING ENGINEERS — L-MS003M



NOTES:
1. WALL HEIGHT IS TOTAL HEIGHT FROM TOP OF WALL TO TOP OF LEVELING PAD
2. FINISHED GRADE MUST PROVIDE POSITIVE DRAINAGE
3. ALL BACKFILL MATERIALS ARE COMPACTED TO 95% MAXIMUM DENSITY.
4. STRUCTURAL DESIGN OF WALL BY OTHERS.

SECTION VIEW

9 SOLID CONCRETE BLOCK RETAINING WALL (FOR PRICING ONLY)

2012 TRUDELL CONSULTING ENGINEERS

TRUDELL CONSULTING ENGINEERS
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Revisions

No.	Description	Date	By

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For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

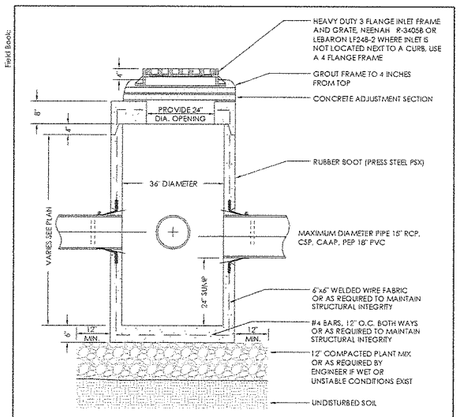
Sheet Title

Site Details

Date:	11/21/2012
Scale:	Shown
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

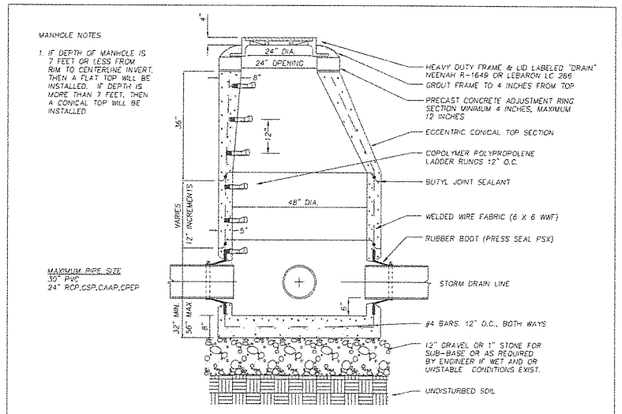
C8-01

Project References



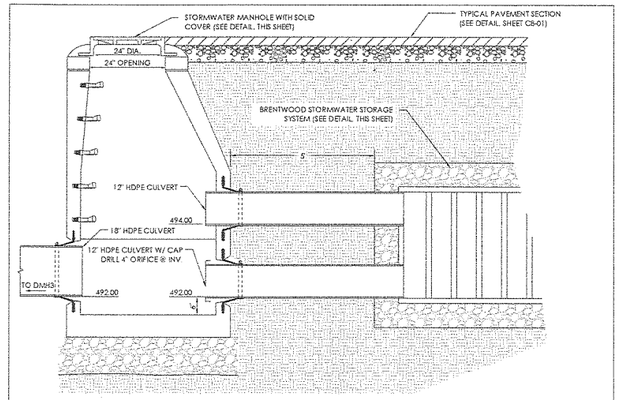
1 TYPE "B" CATCH BASIN 1/2"=1'-0"

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 11/30/2012 DR-010S



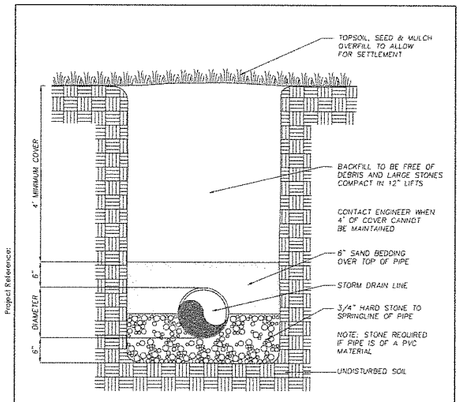
2 TYPICAL STORMWATER MANHOLE 1/2"=1'

2007 TRUDELL CONSULTING ENGINEERS LAST REVISED 03/05/07 DR-010M

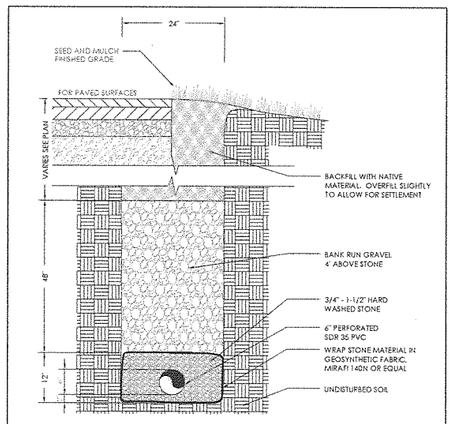


3 SUBSURFACE STORMWATER DETENTION SYSTEM OUTLET STRUCTURE

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 11/14/2012

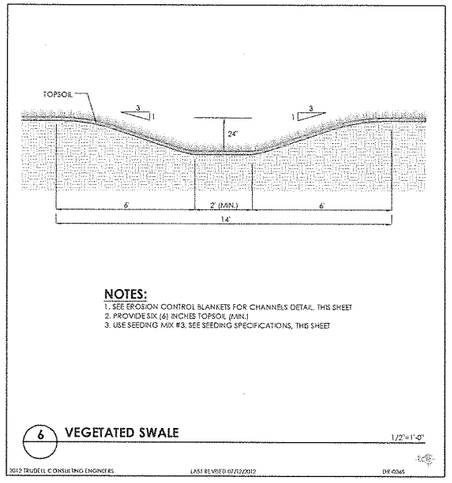


4 TYPICAL STORM DRAIN TRENCH 3/4"=1'-0"



5 TYPICAL UNDERDRAIN CROSS SETCION 3/4"=1'

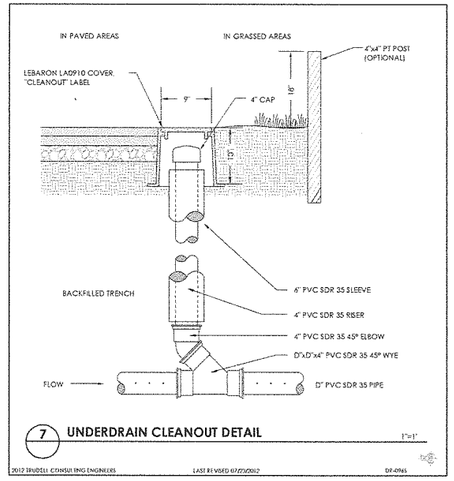
2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 08/03/2012 DR-010S



NOTES:
1. SEE EROSION CONTROL BLANKETS FOR CHANNELS DETAIL, THIS SHEET
2. PROVIDE SIX (6) INCHES TOPSOIL (MIN.)
3. USE SEEDING MIX #3, SEE SEEDING SPECIFICATIONS, THIS SHEET

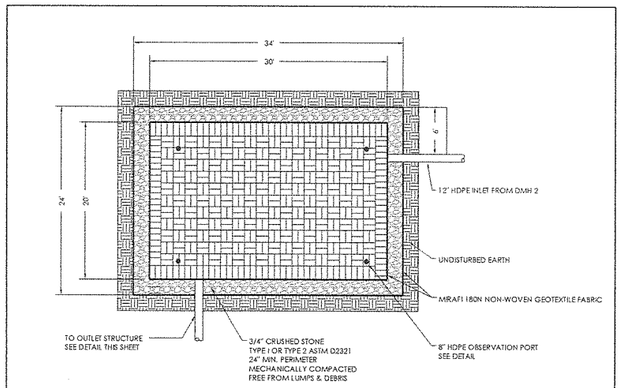
6 VEGETATED SWALE 1/2"=1'-0"

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 07/12/2012 DR-010S



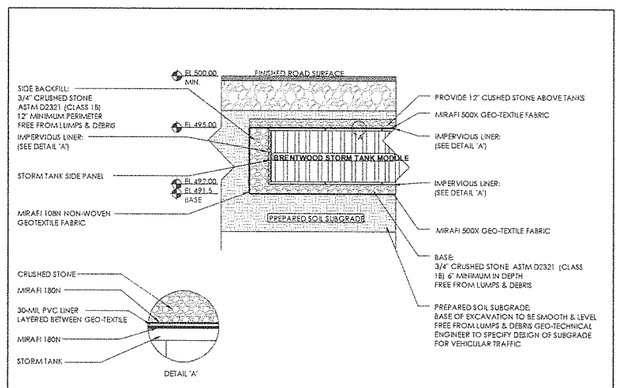
7 UNDERDRAIN CLEANOUT DETAIL 1"=1'

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 07/12/2012 DR-010S



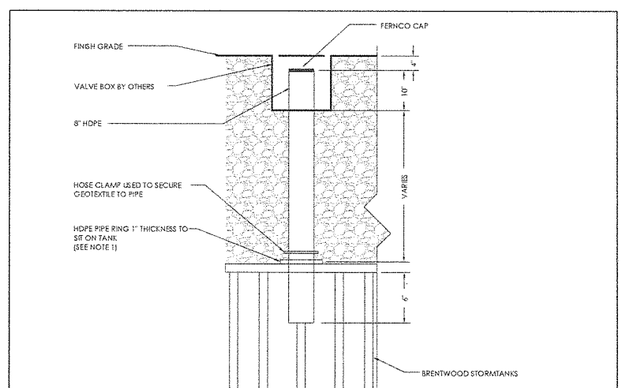
8 SUBSURFACE STORMWATER DETENTION STRUCTURE

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 11/13/2012 DR-120M



9 SUBSURFACE STORMWATER DETENTION STRUCTURE CROSS SECTION

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 11/13/2012 DR-120M



10 OBSERVATION PORT

2012 TRUDELL CONSULTING ENGINEERS LAST REVISED 11/13/2012 DR-120M

TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
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Revisions

No.	Description	Date	By

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STATE OF VERMONT — ALICIA A. DUFF — No. 9020 CIVIL — LICENSED PROFESSIONAL ENGINEER

For Permitting Only

Project Title

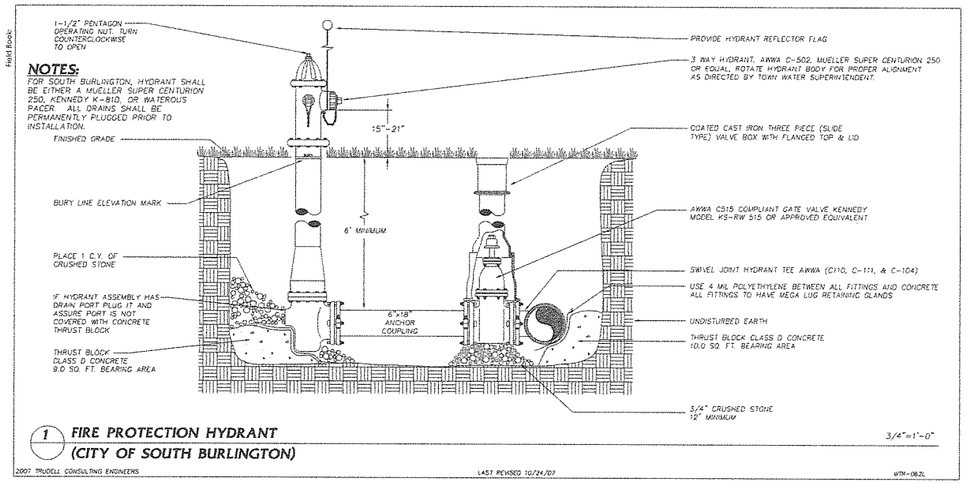
Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

Storm Details

Date:	11/21/2012
Scale:	Shown
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

C8-02

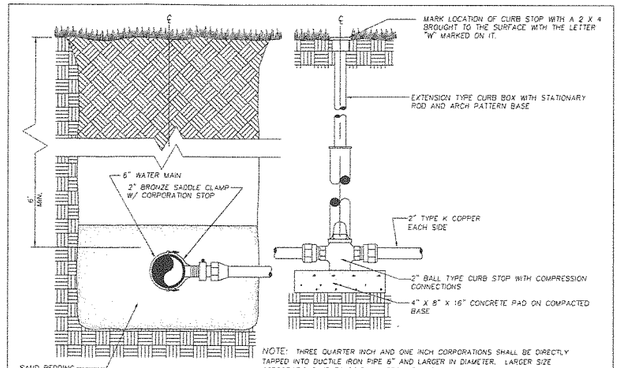


NOTES:
FOR SOUTH BURLINGTON, HYDRANT SHALL BE EITHER A MUELLER SUPER CENTURION 250, KENNEDY K-81D, OR WATEROUS PACER. ALL DRAINS SHALL BE PERMANENTLY PLUGGED PRIOR TO INSTALLATION.

1 FIRE PROTECTION HYDRANT (CITY OF SOUTH BURLINGTON)

3/4"=1'-0"

2007 TRUDELL CONSULTING ENGINEERS — LAST REVISED 10/24/07 — WTR-062L



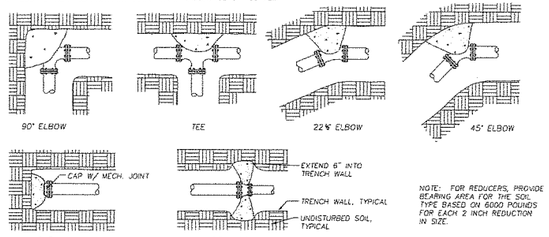
NOTE: THREE QUARTER INCH AND ONE INCH CORPORATIONS SHALL BE DIRECTLY TAPPED INTO DUCTILE IRON PIPE 6" AND LARGER IN DIAMETER. LARGER SIZE CORPORATIONS UP TO 2" SHALL REQUIRE USE OF A TAPPING SADDLE. CORPORATIONS SHALL BE LEAD FREE CAMBRIDGE BRASS. A CONNECTION MADE TO A PIPE THAT REQUIRES A SADDLE OR IS NOT DUCTILE IRON WILL HAVE A BODY WITH A SUITABLE OUTLET, SEAL, AND SUITABLE MEANS FOR ATTACHMENT TO THE MAIN. THE SADDLE SHALL PROVIDE A DRIP TIGHT CONNECTION AND SHALL BE TEFLON OR EPOXY COATED WITH STAINLESS STEEL STRAPS, BOLTS, NUTS AND MECHANISM FOR ATTACHING TO THE PIPE BARREL.

2 SERVICE CONNECTION

1"=1'-0"

2007 TRUDELL CONSULTING ENGINEERS — LAST REVISED 05/30/07 — WTR-056G

USE CLASS D (2500 PSI) CONCRETE FOR THRUST BLOCKS. PLACE 4 MIL POLYETHYLENE BETWEEN FITTING AND THRUST BLOCK. PLACE THRUST BLOCK AGAINST UNDISTURBED TRENCH WALL. CONCRETE BEARING AREA ON FITTING TO BE A MINIMUM OF 1/2 SQUARE FOOT. THRUST BLOCKS BASED ON 200 PSI WORKING PRESSURE PLUS SURGE ALLOWANCE OF 100 PSI.



NOTE: FOR REDUCERS, PROVIDE BEARING AREA FOR THE SOIL TYPE BASED ON 6000 POUNDS FOR EACH 2 INCH REDUCTION IN SIZE.

Project Reference:

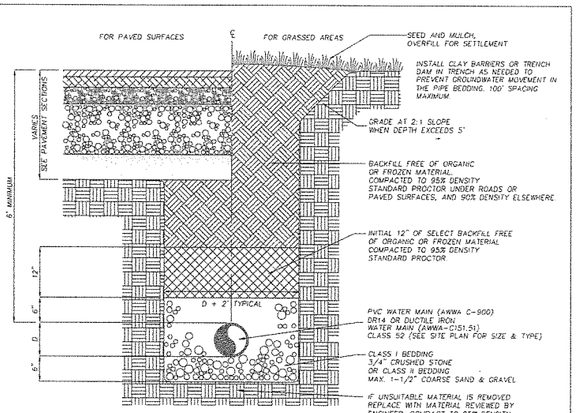
THRUST BLOCK TABLE — MINIMUM BEARING AREA IN SQUARE FEET ON UNDISTURBED TRENCH WALL

SOIL TYPE	SAFE BEARING LOAD LBS./FT.²	2", 3" & 4"				6"				8"				10"				12"			
		CAP OR TEE	90°	45°	22.5°	CAP OR TEE	90°	45°	22.5°	CAP OR TEE	90°	45°	22.5°	CAP OR TEE	90°	45°	22.5°	CAP OR TEE	90°	45°	22.5°
CLAY	1000	5.0	7.0	4.0	2.0	10.5	15.0	8.0	4.0	18.0	25.0	14.0	7.0	28.0	38.0	21.0	10.5	39.0	55.0	30.0	15.0
SAND	2000	2.5	3.5	2.0	1.0	5.5	7.5	4.0	2.0	9.0	13.0	7.0	3.5	14.0	19.0	10.0	5.0	20.0	27.5	15.0	8.0
GRAVEL	3000	2.0	2.5	1.5	1.0	3.5	5.0	3.0	1.5	6.0	8.5	5.0	2.5	9.0	12.5	7.0	4.5	13.0	18.5	10.0	5.0
TILL	4000	1.5	2.0	1.0	0.5	3.0	4.0	2.0	1.0	4.5	6.5	3.5	2.0	7.0	9.5	5.0	2.5	10.0	14.0	7.5	4.0
SHALE	10000	0.5	1.0	0.5	0.5	1.0	1.5	1.0	0.5	2.0	2.5	1.5	1.0	3.0	3.5	2.0	1.0	4.0	5.5	3.0	1.5

3 WATER MAIN THRUST BLOCKS

NTS

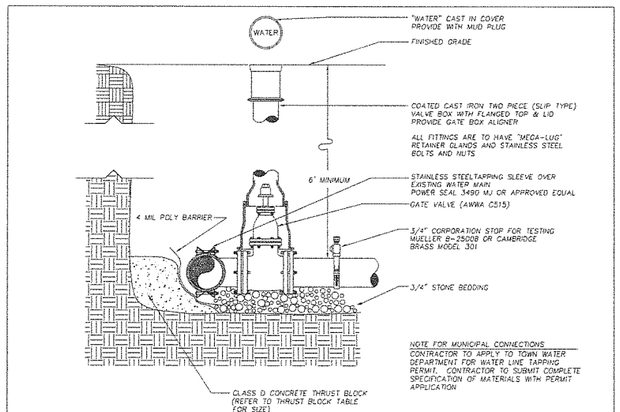
2011 TRUDELL CONSULTING ENGINEERS — LAST REVISED 02/07/11 — WTR-021W



4 TYPICAL WATER TRENCH

3/4"=1'-0"

2011 TRUDELL CONSULTING ENGINEERS — LAST REVISED 02/07/11 — WTR-026W



5 TYPICAL TAPPING VALVE

3/4"=1'-0"

2007 TRUDELL CONSULTING ENGINEERS — LAST REVISED 08/14/12 — WTR-037M

CONTRACTOR'S CERTIFICATION REQUIRED

PRIOR TO THE DESIGN ENGINEER CERTIFYING THAT THE INSTALLATION HAS BEEN INSTALLED IN ACCORDANCE WITH THE PERMITTED DESIGN, THE CONTRACTOR SHALL PROVIDE A CERTIFICATION THAT THE WATER SYSTEM WAS INSTALLED AND TESTED IN ACCORDANCE WITH THE APPROVED DESIGN PLANS. STATE PERMITS REQUIRE THERE SHALL BE NO DEVIATIONS FROM THE APPROVED PLANS WITHOUT PRIOR APPROVALS. THE DESIGN ENGINEER SHALL BE NOTIFIED AND ALLOWED TO OBSERVE THE CRITICAL PHASES OF CONSTRUCTION INCLUDING ANY REQUIRED TESTS. LIKEWISE, THE DESIGN ENGINEER SHALL BE NOTIFIED OF ANY DEVIATIONS FROM THE APPROVED PLANS. SINCE THE DESIGN ENGINEER DOES NOT CUSTOMARILY OBSERVE ALL PHASES OF THE WORK, OR ALL TESTING, HE MAY RELY ON THE CONTRACTOR'S CERTIFICATION AS THE BASIS FOR FINAL CERTIFICATION. THE CONTRACTOR SHALL THEREFORE SIGN AND RETURN A COPY OF THE FOLLOWING CERTIFICATION UPON COMPLETION OF THE WORK.

"I HEREBY CERTIFY THAT I HAVE INSTALLED, PROPERLY TESTED, AND SUCCESSFULLY PASSED THOSE TESTS, AND THE WATER SYSTEM(S) ARE BUILT IN ACCORDANCE WITH THE APPROVED DESIGN PLANS AND APPLICABLE PERMIT CONDITIONS."

CONTRACTOR NAME _____

AUTHORIZED AGENTS NAME _____

SIGNATURE _____ DATE _____

NOTE ANY DEVIATIONS FROM APPROVED PLANS HERE:

_____

_____

_____

_____

6 CONTRACTOR'S CERTIFICATION FOR POTABLE WATER SYSTEMS

2009 TRUDELL CONSULTING ENGINEERS — LAST REVISED 11/06/09 — WTR-064S

TESTING WATER MAINS

*ALL TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE TOWN ENGINEER OR PUBLIC WORKS DEPARTMENT AND TRUDELL CONSULTING ENGINEERS (TCE)

A. AFTER THE PIPE HAS BEEN LAID AND 7 DAYS AFTER THE CONCRETE THRUST BLOCKS AND ANCHORS HAVE BEEN PLACED, THE WATER MAIN SHALL BE HYDROSTATICALLY TESTED ACCORDING TO THE LATEST EDITION OF THE AWWA SPECIFICATION C-600.

B. CONTRACTOR SHALL SUPPLY ALL NECESSARY APPARATUS TO PERFORM THE HYDROSTATIC TEST.

C. TEST PRESSURE SHALL BE 200 POUNDS PER SQUARE INCH OR 1.5 TIMES THE WORKING PRESSURE MEASURED AT OR NEAR THE HIGH POINT IN THE SYSTEM, WHICHEVER IS GREATER. TEST SHALL BE A MINIMUM OF 2 HOURS IN DURATION. TESTING ALLOWANCE SHALL BE DEFINE AS THE QUANTITY OF MAKEUP WATER THAT MUST BE SUPPLIED INTO THE NEWLY LAID PIPE OR ANY VALVED SECTION THEREOF TO MAINTAIN PRESSURE WITHIN 5 PSI (34.5 kPa) OF THE SPECIFIED TEST PRESSURE AFTER THE PIPE HAS BEEN FILLED WITH WATER AND THE AIR HAS BEEN EXPELLED. TESTING ALLOWANCE SHALL NOT BE MEASURED BY A DROP IN PRESSURE IN A TEST SECTION OVER A PERIOD OF TIME.

D. THE PROJECT ENGINEER AND THE MUNICIPALITY SHALL BE CONTACTED 48 HOURS PRIOR TO TESTING.

E. ALL VALVES SHOULD BE VERIFIED AS BEING OPEN OR CLOSED AS APPROPRIATE FOR THE PORTION OF THE WATER MAIN BEING TESTED.

F. ALLOWABLE LEAKAGE SHALL BE COMPUTED BY THE FORMULA: $L=(S \times D \sqrt{P})/148,000$ WHERE L IS LEAKAGE IN GALLONS PER HOUR, S IS THE LENGTH OF PIPE TESTED IN FEET, D IS THE NOMINAL DIAMETER OF THE PIPE IN INCHES AND P IS THE AVERAGE TEST PRESSURE IN POUNDS PER SQUARE INCH DURING THE TEST

G. REPLACE AND RETEST ANY WORK FOUND TO BE DEFECTIVE AT NO EXPENSE TO OWNER.

TESTING HYDRANTS

A. AFTER TESTING THE WATER MAINS, OPEN THE HYDRANT FULLY AND FILL WITH WATER. TO PREVENT CAPS FROM BEING BLOWN OFF, VENT AIR FROM ONE OF THE CAPS WHILE IT IS BEING FILLED. WHEN ALL THE AIR HAS ESCAPED, TIGHTEN THE CAP.

B. ALLOW THE PRESSURE TO BUILD UP TO MAIN LINE PRESSURE AND CHECK FOR LEAKAGE AT FLANGES, NOZZLES AND THE OPERATING STEM.

C. CLOSE THE HYDRANT, REMOVE ONE NOZZLE CAP AND PLACE THE PALM OF YOUR HAND OVER THE OPENING. DRAINAGE SHOULD CREATE A NOTICEABLE SUCTION.

7 TESTING WATER MAINS AND HYDRANTS

2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 04/12/2010 — WTR-030S

DISINFECTING WATER MAINS AND SYSTEMS

*ALL TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE TOWN ENGINEER OR PUBLIC WORKS DEPARTMENT AND TRUDELL CONSULTING ENGINEERS (TCE)

A. PRIOR TO BEING PUT INTO SERVICE, WATER MAINS SHALL BE DISINFECTED ACCORDING TO THE LATEST EDITION OF AWWA SPECIFICATION C-651. THE TABLET METHOD IN AWWA STANDARD 651 IS NOT ACCEPTABLE.

B. THE NEW LINE SHALL BE FLUSHED AT A VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND (OPEN 2-1/2 INCH HYDRANT CONNECTION). FLUSH FOR A PERIOD DETERMINED BY THE ENGINEER FOR THE LENGTH OF MAIN TO BE DISINFECTED.

C. CHLORINATION SHALL BE ACCOMPLISHED BY INTRODUCING A HYPOCHLORITE SOLUTION WITH A CONCENTRATION OF GREATER THAN 25 PARTS PER MILLION OF FREE CHLORINE

D. USING A NOZZLE AT EACH END HYDRANT, CONTROL THE RATE OF FLOW INTO THE NEW MAIN AND PROPORTIONALLY FEED THE HYPOCHLORITE SOLUTION INTO THE MAIN. AFTER THE CHLORINE HAS REACHED ALL POINTS IN THE SYSTEM, CLOSE THE VALVE SUPPLYING WATER FROM THE EXISTING MAIN AND THE END HYDRANTS. MAINTAIN THE HEAVILY CHLORINATED WATER IN THE MAIN FOR 24 HOURS DURING WHICH TIME ALL MAIN LINE VALVES SHOULD BE OPERATED. AFTER 24 HOURS THE MINIMUM CHLORINE RESIDUAL MUST BE AT LEAST 10 PARTS PER MILLION.

E. FLUSH HEAVILY CHLORINATED WATER FROM THE LINE AND REFILL THE LINE FOR SERVICE (USE CHLORINE DIFFUSER). TAKE AND SUBMIT TWO BACTERIOLOGICAL SAMPLES OF THE WATER TO THE STATE OF VERMONT OR A STATE APPROVED TESTING LABORATORY. IF THE RESULTS ARE UNSATISFACTORY, THE DISINFECTION PROCEDURE WILL BE REPEATED UNTIL SATISFACTORY RESULTS ARE OBTAINED.

F. FINISHED WATER STORAGE STRUCTURES SHALL BE DISINFECTED IN ACCORDANCE WITH CURRENT AWWA STANDARD C652. TWO OR MORE SUCCESSIVE SETS OF SAMPLES, TAKEN AT 24 HOUR INTERVALS, SHALL INDICATE MICROBIOLOGICALLY SATISFACTORY WATER BEFORE THE FACILITY IS PLACES INTO OPERATION.

G. DISPOSAL OF HEAVILY CHLORINATED WATER FROM THE TANK DISINFECTION PROCESS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE SECRETARY.

H. THE DISINFECTION PROCEDURE (AWWA CHLORINATION METHOD 3, SECTION 4.3 C652) WHICH ALLOWS USE OF THE CHLORINATED WATER HELD IN THE STORAGE TANK FOR DISINFECTION PURPOSES IS NOT RECOMMENDED. WHEN THAT PROCEDURE IS USED, IT IS REQUIRED THAT THE INITIAL HEAVILY CHLORINATED WATER BE PROPERLY DISPOSED IN ORDER TO PREVENT RELEASE OF WATER WHICH MAY CONTAIN VARIOUS CHLORINATED ORGANIC COMPOUNDS INTO THE DISTRIBUTION SYSTEM.

8 DISINFECTION OF WATER SYSTEM

2010 TRUDELL CONSULTING ENGINEERS — LAST REVISED 02/16/10 — WTR-029S

TRUDELL CONSULTING ENGINEERS
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Revisions

No.	Description	Date	By

STATE OF VERMONT — ALAN A. DEMA — No. 9020 — CIVIL — PROFESSIONAL ENGINEER

For Permitting Only

Project Title

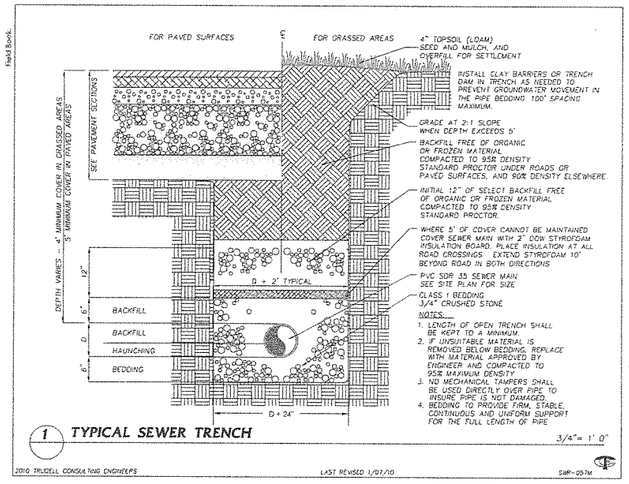
Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

Water Details

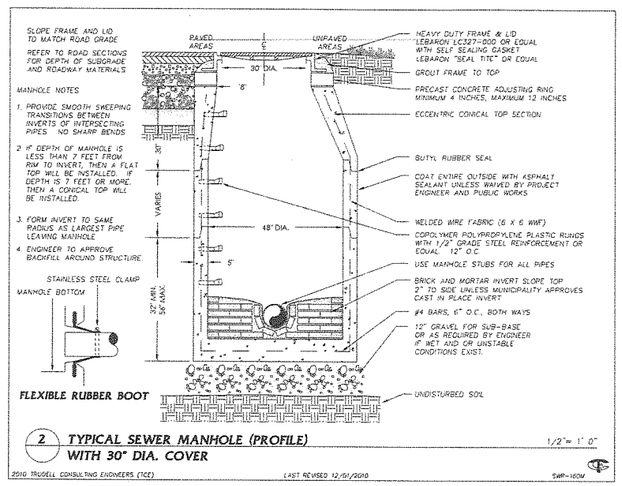
Date:	11/21/2012
Scale:	Shown
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

C8-03



1 TYPICAL SEWER TRENCH 3/4"= 1' 0"

 LAST REVISED 1/07/10 SWR-057M



2 TYPICAL SEWER MANHOLE (PROFILE) WITH 30" DIA. COVER 1/2"= 1' 0"

 LAST REVISED 12/01/2010 SWR-160M

TESTING SEWER MANHOLES

*ALL TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE TOWN ENGINEER OR PUBLIC WORKS DEPARTMENT AND TRUDELL CONSULTING ENGINEERS (TCE)

A. EACH MANHOLE SHALL BE TESTED BY MEANS OF A WATER TEST OR VACUUM TEST PRIOR TO THE BACKFILLING OF THE STRUCTURE. IN ANY CASE THERE SHALL BE NO VISIBLE LEAKAGE INTO THE BASE OR WALLS OF A COMPLETED MANHOLE

B. AFTER THE MANHOLE HAS BEEN ASSEMBLED IN PLACE, ALL LIFTING HOLES AND EXTERIOR JOINTS SHALL BE FILLED AND POINTED WITH AN APPROVED NON-SHRINKING MORTAR. THE TEST SHALL BE MADE PRIOR TO PLACING THE SHELF AND INVERT IF THE GROUNDWATER TABLE HAS BEEN ALLOWED TO RISE ABOVE THE BOTTOM OF THE MANHOLE, THE ENGINEER MAY DIRECT IT TO BE LOWERED FOR THE DURATION OF THE TEST. ALL PIPES AND OTHER OPENINGS INTO THE MANHOLE SHALL BE SUITABLY PLUGGED AND THE PLUGS BRACED TO PREVENT BLOWOUT

C. IF THE CONTRACTOR ELECTS TO BACKFILL PRIOR TO WATER TESTING, FOR ANY REASON, IT SHALL BE AT HIS OWN RISK AND IT SHALL BE INCUMBENT UPON THE CONTRACTOR TO DETERMINE THE REASON FOR ANY FAILURE OF THE TEST. NO ADJUSTMENT IN THE LEAKAGE ALLOWANCE WILL BE MADE FOR UNKNOWN CAUSES SUCH AS LEAKAGE OF PLUGS, ABSORPTION, ETC. I.E., IT WILL BE ASSUMED THAT ALL LOSS OF WATER DURING THE TEST IS A RESULTS OF LEAKS THROUGH THE JOINTS OR THROUGH THE CONCRETE. FURTHERMORE, THE CONTRACTOR SHALL TAKE ANY STEPS NECESSARY TO ASSURE THE ENGINEER THAT THE WATER TABLE IS BELOW THE BOTTOM OF THE MANHOLE THROUGHOUT THE TEST

D. IF THE GROUNDWATER TABLE IS ABOVE THE HIGHEST JOINT IN THE MANHOLE, AND IF THERE IS NO LEAKAGE INTO THE MANHOLE AS DETERMINED BY THE ENGINEER, SUCH A TEST CAN BE USED TO EVALUATE THE WATER TIGHTNESS OF THE MANHOLE. HOWEVER, IF THE ENGINEER IS NOT SATISFIED, THE CONTRACTOR SHALL LOWER THE WATER TABLE AND CARRY OUT THE TEST AS DESCRIBED HEREINBEFORE

E. WATER TEST: THE MANHOLE SHALL THEN BE FILLED WITH WATER TO THE TOP OF THE CONE SECTION. A PERIOD OF ONE HOUR WILL BE PERMITTED TO ALLOW FOR ABSORPTION. AT THE END OF THIS PERIOD, THE MANHOLE SHALL BE REFILLED TO THE TOP OF THE CONE, IF NECESSARY, AND THE MEASURING TAKE OF AT LEAST 6 HOURS BEGUN. AT THE END OF THE TEST PERIOD, THE MANHOLE SHALL BE REFILLED TO THE TOP OF THE CONE MEASURING THE VOLUME OF WATER ADDED. THIS AMOUNT SHALL BE CONVERTED TO A 24 HOUR RATE AND THE LEAKAGE DETERMINED ON THE BASIS OF DEPTH. THE LEAKAGE FOR EACH MANHOLE SHALL NOT EXCEED ONE GALLON PER VERTICAL FOOT FOR A 24 HOUR PERIOD. REPAIRS BY APPROVED METHODS MAY BE MADE, AS DIRECTED BY THE ENGINEER, TO BRING THE LEAKAGE WITHIN ALLOWABLE RATE OF ONE GALLON PER FOOT PER DAY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO UNCOVER THE MANHOLE, AS NECESSARY, AND TO DISASSEMBLE, RECONSTRUCT OR REPLACE IT AS DIRECTED BY THE ENGINEER. THE MANHOLE SHALL THEN BE RETESTED.

F. VACUUM TEST: THE CONTRACTOR SHALL FURNISH THE MANHOLE CONE SEAL, VACUUM PUMP, ALL NECESSARY GAUGES, HOSES, AND EQUIPMENT TO PERFORM THE TEST.

G. FILL ALL LIFTING HOLES AND EXTERIOR JOINTS WITH APPROVED NON-SHRINKING MORTAR AND PLUG ALL OTHER OPENINGS INTO THE MANHOLE TO PREVENT DISPLACEMENT. THE COMPLETED MANHOLE SHALL NOT BE BACKFILLED PRIOR TO VACUUM TESTING. MANHOLES THAT HAVE BEEN BACKFILLED SHALL BE EXCAVATED TO EXPOSE THE ENTIRE EXTERIOR OR THE WATER TEST SHALL BE USED.

H. INSTALL AN INFLATABLE RUBBER RING THE SIZE OF THE TOP OF THE MANHOLE BY INFLATING THE RING WITH AIR, TO A PRESSURE ADEQUATE TO PREVENT LEAKAGE OF AIR BETWEEN THE RING AND THE MANHOLE WALL

I. PUMP THE AIR OUT OF THE MANHOLE THROUGH AN OPENING IN THE TEST PLATE UNTIL A VACUUM IS CREATED INSIDE THE MANHOLE EQUAL TO 10 INCHES OF MERCURY USING AN APPROVED VACUUM GAUGE. THEN STOP THE REMOVAL OF AIR AND BEGIN THE TEST.

J. THE VACUUM CAN NOT DROP BELOW 9 INCHES OF MERCURY WITHIN A 2 MINUTE TEST PERIOD. IF MORE THAN A 1 INCH DROP OCCURS WITHIN 2 MINUTES, THE MANHOLE HAS FAILED THE TEST, AND IT SHALL BE REPAIRED OR RECONSTRUCTED AND THEN RETESTED UNTIL IT PASSES AT NO EXPENSE TO OWNER

K. BACKFILL AROUND THE MANHOLE UPON SATISFACTORY TEST RESULTS

3 TESTING MANHOLES (ENVIRONMENTAL PROTECTION RULES CH 1 EFFECTIVE 9/29/07 SECTION 1-A-03(I)(8))

 LAST REVISED 11/08/2009 SWR-100M

CONTRACTOR'S CERTIFICATION REQUIRED

PRIOR TO THE DESIGN ENGINEER CERTIFYING THAT THE INSTALLATION HAS BEEN INSTALLED IN ACCORDANCE WITH THE PERMITTED DESIGN, THE CONTRACTOR SHALL PROVIDE A CERTIFICATION THAT THE WASTEWATER SYSTEM WAS INSTALLED AND TESTED IN ACCORDANCE WITH THE APPROVED DESIGN PLANS. STATE PERMITS REQUIRE THERE SHALL BE NO DEVIATIONS FROM THE APPROVED PLANS WITHOUT PRIOR APPROVALS. THE DESIGN ENGINEER SHALL BE NOTIFIED AND ALLOWED TO OBSERVE THE CRITICAL PHASES OF CONSTRUCTION INCLUDING ANY REQUIRED TESTS. LIKEWISE, THE DESIGN ENGINEER SHALL BE NOTIFIED OF ANY DEVIATIONS FROM THE APPROVED PLANS. SINCE THE DESIGN ENGINEER DOES NOT CUSTOMARILY OBSERVE ALL PHASES OF THE WORK, OR ALL TESTING, THEY MAY RELY ON THE CONTRACTOR'S CERTIFICATION AS THE BASIS FOR FINAL CERTIFICATION. THE CONTRACTOR SHALL THEREFORE SIGN AND RETURN A COPY OF THE FOLLOWING CERTIFICATION UPON COMPLETION OF THE WORK:

"I HEREBY CERTIFY THAT I HAVE INSTALLED, PROPERLY TESTED, AND SUCCESSFULLY PASSED THOSE TESTS, AND THE WASTEWATER SYSTEM(S) ARE BUILT IN ACCORDANCE WITH THE APPROVED DESIGN PLANS AND APPLICABLE PERMIT CONDITIONS."

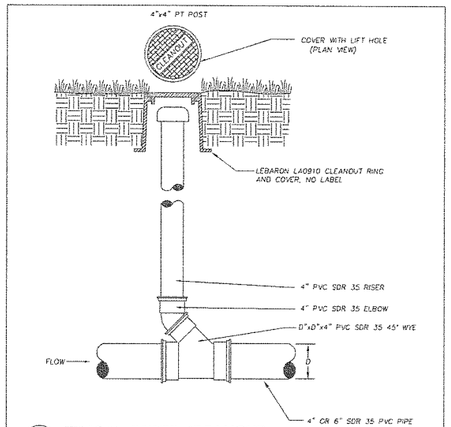
CONTRACTOR NAME

AUTHORIZED AGENTS NAME

SIGNATURE DATE

NOTE ANY DEVIATIONS FROM APPROVED PLANS HERE:

4 CONTRACTOR'S CERTIFICATION FOR WASTEWATER SYSTEMS



5 TYPICAL SEWER CLEANOUT 1"= 1' 0"

 LAST REVISED 03/18/2010 SWR-058S

AIR TESTING SEWERS

*ALL TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE TOWN ENGINEER OR PUBLIC WORKS DEPARTMENT AND TRUDELL CONSULTING ENGINEERS (TCE)

A. TEST THE GRAVITY SEWER BY A PRESSURIZED AIR TEST BETWEEN CONSECUTIVE MANHOLES. PLUG ALL OPENINGS OF THE TEST SECTION AND CONNECT THE AIR CONTROL EQUIPMENT TO THE APPARENT END.

B. SUPPLY AIR SLOWLY TO THE PIPE UNTIL REACHING A CONSTANT PRESSURE OF 4 PSI, GREATER THAN THE AVERAGE PRESSURE OF ANY GROUNDWATER. THROTTLE THE AIR SUPPLY SO THAT THE PRESSURE REMAINS ABOVE 3.0 PSI FOR AT LEAST 5 MINUTES TO ALLOW TEMPERATURE STABILIZATION IN THE PIPE. MONITOR PRESSURE WITH A GAUGE HAVING A RANGE FROM 0 TO 5 PSI. THE GAUGE SHOULD HAVE A MAXIMUM DIVISIONS OF 0.1 PSI AND AN ACCURACY OF +- 0.04 PSI. REGULATE THE AIR PRESSURE TO PREVENT IT FROM EXCEEDING 5.0 PSI.

C. AFTER STABILIZATION, ADJUST PRESSURE TO 3.5 PSI OR ABOVE AND SHUT OFF AIR SUPPLY. START THE STOP WATCH. THE TIME REQUIRED FOR THE PIPE SIZE PER UNIT LENGTH TO DROP 1 PSI MUST BE AT LEAST:

NOMINAL PIPE SIZE IN INCHES	T (TIME) MIN/100 FT.	NOMINAL PIPE SIZE IN INCHES	T (TIME) MIN/100 FT.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

D. IF THE SECTION OF LINE TO BE TESTED INCLUDES MORE THAN ONE PIPE SIZE, CALCULATE THE TEST TIME FOR EACH SIZE AND ADD THE TEST TIMES TO EQUAL THE TOTAL SECTION TEST TIME.

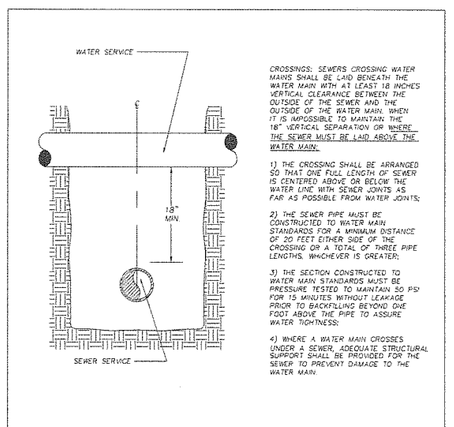
E. IF THERE IS GROUND WATER ABOVE THE SEWER LINE THE AIR TEST PRESSURE WILL BE INCREASED BY 0.5 PSI FOR EACH FOOT OF WATER ABOVE THE INVERT OF THE PIPE. DIFFERENCES DUE TO AIR TEMPERATURE AND BAROMETRIC PRESSURE WILL BE CONSIDERED NEGLIGIBLE.

F. IF THE TEST TIME TO DROP 1 PSI IS LESS THAN THAT REQUIRED IN THE ABOVE TABLE, THE PIPE WILL HAVE FAILED AND ADEQUATE REPAIRS AND RETESTING WILL BE REQUIRED AT NO EXPENSE TO OWNER.

G. IT IS NOT NECESSARY TO HOLD THE TEST FOR THE WHOLE PERIOD WHEN IT IS CLEARLY EVIDENT THAT THE RATE OF AIR LOSS IS LESS THAN THE ALLOWABLE.

6 TESTING GRAVITY SEWERS (ENVIRONMENTAL PROTECTION RULES) CH 1 EFFECTIVE 9/29/07 SECTION 1-A-03(k)(2)

 LAST REVISED 02/26/10 SWR-009S



CROSSINGS: SEWERS CROSSING WATER MAINS SHALL BE LAID BENEATH THE WATER MAIN WITH AT LEAST 18 INCHES VERTICAL CLEARANCE BETWEEN THE OUTSIDE OF THE SEWER AND THE OUTSIDE OF THE WATER MAIN. WHEN IT IS IMPOSSIBLE TO MAINTAIN THE 18" VERTICAL SEPARATION OR WHERE THE SEWER MUST BE LAID ABOVE THE WATER MAIN:

1) THE CROSSING SHALL BE ARRANGED SO THAT ONE FULL LENGTH OF SEWER IS CENTERED ABOVE OR BELOW THE WATER LINE WITH SEWER JOINTS AS FAR AS POSSIBLE FROM WATER JOINTS;

2) THE SEWER PIPE MUST BE CONSTRUCTED TO WATER MAIN STANDARDS FOR A MINIMUM DISTANCE OF 20 FEET EITHER SIDE OF THE CROSSING OR A TOTAL OF THREE PIPE LENGTHS, WHICHEVER IS GREATER;

3) THE SECTION CONSTRUCTED TO WATER MAIN STANDARDS MUST BE PRESSURE TESTED TO MAINTAIN 50 PSI FOR 15 MINUTES WITHOUT LEAKAGE PRIOR TO BACKFILLING BEYOND ONE FOOT ABOVE THE PIPE TO ASSURE WATER TIGHTNESS;

4) WHERE A WATER MAIN CROSSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT SHALL BE PROVIDED FOR THE SEWER TO PREVENT DAMAGE TO THE WATER MAIN.

7 WATER / SEWER CROSSING 1"= 1' 0"

 LAST REVISED 01/07/10 SWR-062S

Hard Back

Project Reference:

TRUDELL CONSULTING ENGINEERS
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Revisions

No. Description Date

For Permitting Only

Project Title

Sisters and Brothers Investment Group
110 Riverside Ave.
Burlington, Vermont

Sheet Title

Sewer Details

Date:	11/21/2012
Scale:	Shown
Project Number:	2010083
Drawn By:	PJM
Project Engineer:	AAL
Approved By:	

C8-04